FINAL
ENVIRONMENTAL IMPACT STATEMENT
(VOLUME I – MAIN REPORT)
Highwood Generating Station

Southern Montana Electric Generation
& Transmission Cooperative, Inc.

United States Department of Agriculture –
Rural Utilities Service

Montana Department of Environmental Quality

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FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)
HIGHWOOD GENERATING STATION
Great Falls, Montana

USDA Rural Utilities Service
Washington, D.C.

Montana Department of Environmental Quality
Helena, Montana

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Abstract

Southern Montana Electric Generation and Transmission Cooperative, Inc. (SME) proposes to build a 250-megawatt (MW) coal-fired power plant – the Highwood Generating Station (HGS) – and 6 MW of wind generation at a site near Great Falls, Montana. SME has applied for a loan guarantee to construct the HGS from the Rural Development Utilities Program (RD) of the U.S. Department of Agriculture (USDA). SME has also applied for an air quality permit and other environmental permits and licenses from the Montana Department of Environmental Quality (DEQ). In order to fulfill their respective obligations under the National Environmental Policy Act (NEPA) and the Montana Environmental Policy Act (MEPA), RD and DEQ have jointly prepared an Environmental Impact Statement (EIS). The Proposed Action includes the construction and operation of a 250-MW (net), circulating fluidized bed (CFB), coal-fired generating plant and four 1.5-MW wind turbines. The EIS analyzes the potential environmental effects of SME's Proposed Action and alternatives to that action.

The draft EIS was released in June 2006 and public hearings were held at two locations in July and August; the comment period on the draft EIS closed on August 30, 2006. In response to public and agency comments, a number of changes were made to the EIS text itself – including new alternatives and revised significance findings – and the location of the preferred alternative was shifted to reduce cultural and visual impacts on the Great Falls Portage National Historic Landmark.

More than 20 alternatives are evaluated in Chapter Two of the FEIS but eliminated from more detailed consideration because they fail to meet the purpose and need of the Proposed Action – providing 250 MW of base load generation – on the grounds of cost, reliability, or other technical or environmental shortcomings. Alternatives eliminated include: power purchase agreements; energy conservation and efficiency; renewable non-combustible energy sources (wind energy, solar energy, hydroelectricity, geothermal energy); renewable combustible energy sources (biomass, biogas, municipal solid waste); non-renewable combustible energy sources (natural gas combined cycle, microturbines, pulverized coal, integrated gasification combined cycle coal, oil); nuclear power; two alternatives consisting of combinations of renewable resources; and three alternative sites. Several alternative site-specific components also eliminated include: different railroad spur alignments, alternate methods of obtaining potable water, discharging wastewater into the Missouri River, and disposing ash at local landfills. In the FEIS, USDA and DEQ have selected the Proposed Action as their preferred alternative.

Alternatives assessed in detail include the: 1) No Action Alternative; 2) Proposed Action (construction/operation of the HGS and wind turbines at the Salem site eight miles from Great Falls), and 3) Industrial Park Site (construction/ operation of the power plant, but no wind generation, at an alternate site in a designated industrial park just north of Great Falls). The No Action Alternative avoids most direct adverse environmental effects, but potentially entails a number of indirect and cumulative impacts associated with other generation sources from which SME would have to purchase power if unable to generate its own. In most respects, with the exception of cultural resources, impacts from the Proposed Action (2) and Alternative Site (3) are similar, though the proximity of the Alternative Site to greater numbers of residents intensifies some of these impacts, such as traffic, noise, and air quality; nonetheless, impacts would not likely be significant. Potential air quality impacts at both locations would be reduced to non-significant levels through the application of CFB technology and other pollution controls. SME's plant would be subject to Montana air quality permit limits as well as any Montana mercury rule that may be adopted, and EPA's new federal mercury rule. The main potentially significant adverse impacts would be on cultural and visual resources, because constructing the HGS at the Salem site would adversely affect the Great Falls Portage National Historic Landmark (NHL) commemorating the 1805 portage the Lewis and Clark Expedition made around the Great Falls of the Missouri River. Repositioning the HGS and wind turbines reduces but does not eliminate significant impacts on the NHL. Other impacts rated as significant in the final, but not the draft EIS, are temporary impacts on traffic and Level of Service, and long-term impacts to the acoustical environment of the NHL.

To comment on this final EIS, please contact:

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Comments must be received by March 12, 2007.

EXECUTIVE SUMMARY

Introduction

The Southern Montana Electric Generation and Transmission Cooperative, Inc. (SME) proposes to build a 250-megawatt (MW), Circulating Fluidized Bed (CFB), coal-fired power plant – called the Highwood Generating Station (HGS) – and 6 MW of wind generation at a site near Great Falls, MT. This final Environmental Impact Statement (FEIS) discusses this Proposed Action and analyzes its potential effects on the environment.

SME is based in Billings, Montana. As an electric generation and transmission cooperative, it is a non-profit utility owned by its members. As such, it provides wholesale electricity and related services to five electric distribution cooperatives and one municipal utility. The SME member systems are:

- Beartooth Electric Cooperative, Inc., headquartered in Red Lodge, Montana.
- Fergus Electric Cooperative, Inc., headquartered in Lewiston, Montana.
- Mid-Yellowstone Electric Cooperative, Inc., headquartered in Hysham, Montana.
- Tongue River Electric Cooperative, Inc., headquartered in Ashland, Montana.
- Yellowstone Valley Electric Cooperative, Inc., with headquarters at Huntley, Montana.
- Electric City Power, Great Falls, Montana.

SME's 58,000-square mile (150,220-square kilometer) service area encompasses 22 counties in two states – Montana and a very small area of Wyoming. Under its charter, SME is required to meet the electric power needs of the cooperative member systems it serves. SME does not have the capacity to meet all of its members' power needs beyond roughly 2010. After considering various ways to meet those future needs, SME identified the construction of a new coal-fired power plant near Great Falls – the proposed Highwood Generating Station (HGS) – supplemented with four wind turbines on the same site, as its best course of action to meet the electric energy and related service needs of approximately 120,000 Montanans.

SME has applied for a loan guarantee to construct the HGS from the Rural Utilities Service (RUS), an agency which administers the U. S. Department of Agriculture's Rural Development Utilities Programs (USDA Rural Development). The RUS application covers the financing needs of the five cooperative members of SME, representing approximately 75 percent or 185 MW of the total projected load needs of SME. The remaining 25 percent or approximately 65 MW of projected load is planned to be financed separately by Electric City Power. SME has also applied for an air quality permit and other environmental permits and licenses from the Montana Department of Environmental Quality (DEQ). In order to fulfill their respective obligations under the National Environmental Policy Act (NEPA) and the Montana Environmental Policy Act (MEPA), RUS and DEQ have jointly prepared this Environmental Impact Statement (EIS). The Proposed Action includes the construction and operation of a 250-MW (net), CFB coal-fired generating plant and four 1.5-MW wind turbines. The FEIS analyzes the potential environmental effects of the Proposed Action and alternatives to that action.

RUS has established procedures for determining if a proposed project for which a loan or loan guarantee is sought is feasible both from an engineering and financial perspective. Following RUS procedures, SME prepared several proposal development documents, including a System Load Forecast, Alternative Evaluation Study and a Site Selection Study. These studies were subject to RUS's review and approval. Their information and analyses are incorporated into this EIS; they are also available to the public on RUS's website at: http://www.usda.gov/rus/water/ees/eis.htm .

The draft EIS (DEIS) on the HGS was released in June 2006 and public hearings were held in Great Falls and Havre, in July and August respectively. Upon request by an interested party, the comment period on the DEIS was extended by two weeks; it closed on August 30, 2006. Subsequently, in response to public and agency comments and concerns, a number of changes were made to the DEIS text itself – including new alternatives and revised significance findings – and the location of the preferred alternative was shifted to reduce cultural and visual impacts on the Great Falls Portage National Historic Landmark (NHL). The FEIS reflects those changes, which are shown in double-underlining. Also included in the appendices of the FEIS are the comments and agencies' responses to comments, a draft Memorandum of Agreement (MOA) on the NHL, and the final draft Biological Assessment (BA) prepared in compliance with Sec. 7(c) of the Endangered Species Act.

Purpose, Need for, and Benefit of the Proposed Action

Presently, SME meets all of the power requirements for its cooperative member systems by purchasing power from two Federal power suppliers – the Bonneville Power Administration (BPA) and the Western Area Power Administration (WAPA). However, its major supplier (BPA) will end its sales of power to SME by 2011. Thus, SME will need to close the large projected gap between the amount of power it can provide to its cooperative member systems and the amount of power those cooperative member systems need to supply their residential, commercial and industrial customers.

Currently, approximately 20 percent or 20 MW of the cooperative member systems' wholesale supply requirements are met through a power purchase agreement with WAPA. The remaining 80 percent or about 100 MW is met by purchase from BPA under an "all supplemental requirements" contract effective from 2000-2017. The wholesale power requirements of Electric City Power are met with purchases from PPL Montana that will expire in 2011.

A provision of SME's power purchase agreement with BPA allows "recall" of a portion of SME's purchase rights beginning in 2008, and the remaining power purchase rights of the contract by 2011. BPA has now exercised this provision because it has determined that the load requirements of the region which it has a statutory requirement to serve will have needs in excess of its current generating capacity. Under the laws governing BPA, SME is an "extra-regional" customer because it is located east of the continental divide. SME thus faces an imminent wholesale power supply shortfall of major proportions.

Based on SME's existing and projected capacity and energy requirements, in 2009 it will have a resource requirement or deficit of approximately 116 MW. By 2012 this deficit will grow to approximately 160 MW as the BPA power purchase agreement is phased out. Given the price

volatility of natural gas and the lack of viable wholesale power purchase options, SME needs to seriously consider developing an alternate wholesale power supply resource. In addition, Electric City Power has projected resource requirements of approximately 65 MW.
In demonstrating to RUS how to best meet its power supply obligations in the face of a looming phase-out of its main existing power source, SME concluded that owning its own source of electric generation would be in the best interest of its cooperative member systems. SME proposes to construct a 250 MW, CFB coal-fired power plant near Great Falls, Montana. The Proposed Action would also include four 1.5 MW wind turbines, construction of approximately 14 miles (23 km) of transmission lines, substation facilities, pipelines for raw water, potable water and wastewater, and about six miles of railroad tracks for delivery of coal to the plant, in addition to other components.

In addition to providing a reliable supply of electricity at an affordable price, the Proposed Action would furnish local employment in the Great Falls area during construction and operation. It would also provide tax benefits for Cascade County and the City of Great Falls, as well as other associated socioeconomic benefits.

Alternatives Eliminated from Detailed Consideration

The Alternative Evaluation Study and FEIS examined a total of 29 alternative means of responding to the identified purpose and need for the project. These alternatives were evaluated in terms of cost-effectiveness, technical feasibility, and environmental soundness. Twenty-six alternatives were considered but dismissed from more detailed analysis on one or more grounds:

- Power Purchase Agreements – Eliminated because of higher cost and no probable environmental advantage; SME would contribute indirectly to impacts from other generation sources.

- Renewable Non-Combustible Energy Sources –
  Wind Energy – Incapable of providing approximately 250 MW of base load due to its intermittency.
  Solar Energy (photovoltaic and thermal) – Much higher overall cost and inability to serve as base load due to intermittency.
  Hydroelectricity – Scarcity of remaining undeveloped hydro resources in Montana and generally unacceptable environmental impacts.
  Geothermal Energy – Unavailability of sufficient geothermal resources to generate electricity on a commercial scale in Montana.

- Renewable Combustible Energy Sources –
  Biomass – Infeasible due to distance to and uncertainties associated with wood waste supply.
  Biogas – Infeasible due to dispersed locations and insufficient quantities of fuel sources in Montana such as digester gas from organic material and landfill gas.
  Municipal Solid Waste – Unavailability of municipal solid waste in Montana in sufficient quantities to generate 250 MW plus generally high emissions and other environmental problems such as toxic ash and residues.

- Non-Renewable Combustible Energy Sources –
  Natural Gas Combined Cycle – Price volatility and likelihood of significantly higher future costs as a result of rising demand and limited supplies.
  Microturbines – Infeasible due to dispersed locations and insufficient quantities of fuel sources in Montana such as digester gas from organic material and landfill gas.
  Pulverized Coal – Somewhat higher emissions of air pollutants and somewhat higher capital cost than CFB.
  Integrated Gasification Combined Cycle – Not currently cost-effective and requires further research to achieve an acceptable level of reliability; except for still undemonstrated potential to sequester carbon dioxide, does not enjoy significant emissions advantages over CFB.
  Oil – High prices and price volatility, with prospect for even higher prices and volatility in the foreseeable future.

- Nuclear Power – Permitting and construction of nuclear power plants takes considerably longer than for PC or CFB plants and a new plant would face stiff public opposition; moreover, nuclear power is not cost-effective at the scale needed by SME.

- Combinations of Energy Sources –
  Smaller CFB Plant and Renewable Energy Sources – This combination alternative only partially meets the purpose and need of this project in the short-term. It would not provide reliable, cost effective, and consistent energy generation for the predicted long-term load; in addition, transmission constraints and impacts were a key factor in this alternative not being viable.
  Combination of Renewable Energy Sources – This combination alternative would not meet the purpose and need of this project. It would not provide long-term term reliable, cost effective, and consistent energy generation for the predicted load; in addition, transmission constraints and impacts were a key factor in this alternative not being viable.

- Other Coal-Fired Power Plant Sites –
  Decker – More expensive than Great Falls sites; also has a higher degree of risk associated with environmental permitting and approvals; subject to water disruption and the lack of available water rights.
  Hysham – More expensive than either of the Great Falls sites; also has a higher degree of risk associated with environmental permitting and approvals and available water supply and water rights.
  Nelson Creek – More expensive than either of the Great Falls sites; also has a higher degree of risk associated with environmental permitting and approvals and available water supply and water rights.

- Salem Site-Specific Alternative Components –
  Obtaining Potable Water From Other Sources –
    - *Importing bottled water* – Bottled water would not be cost effective in large quantities for site-wide use for anything other than drinking water.

- *Drinking water wells drilled onsite* – Rejected in part because of the 300-450-foot depth to the water-bearing Madison limestone formation.
- *Additional river diversion* – The water treatment facility would be classified as a public water supply and would be subject to state and county regulations; no environmental advantage over connection to and use of City of Great Falls water system.

Directly Discharging Wastewater into the Missouri River – Rejected in favor of discharging into the City of Great Falls' wastewater treatment system on the grounds of environmental benefits and the cost to construct, operate, maintain, and monitor the facility.

Disposing of Sanitary Wastewater in Septic System – Offers no environmental benefits over SME's proposed connection and use of the City of Great Falls wastewater treatment

Alternate Railroad Spur Alignments –

- *Routed south of power plant to abandoned railroad grade* – Rejected because of disadvantages including need for replacing sections of existing, abandoned railroad grade, conversion of privately owned croplands, and routing of coal train traffic through City of Great Falls.
- *Routed north of power plant to City of Great Falls along property lines* – Rejected because of difficult and expensive installation due to rougher terrain, greater environmental impacts at crossings of coulees and watercourses, and the highest estimated cost from the bridges or trestles that would be needed.

Hauling Ash to High Plains Landfill – Rejected because of greater cost and the need to haul 10-12 trucks per day carrying ash through City of Great Falls.

Alternatives Assessed in Detail

No Action Alternative

Under the No Action Alternative, the HGS would not be constructed or operated to meet the projected 250-MW base load needs of SME. There would be no facilities constructed at either the Salem or Industrial Park sites to meet the purpose and need.

However, it is unreasonable to assume that no alternative source of electricity would be provided for SME customers once the current power purchase agreement with the Bonneville Power Administration begins to expire. Therefore, the primary assumption for the No Action Alternative is that the need for a reliable energy supply for the SME service area would still be met by some means, mostly likely the purchase of power from other sources of generation in the West, including those already online and those currently being developed. While no specific generation sources have been identified, it is assumed that power would likely be provided by some mixture of coal, natural gas, oil, hydro, nuclear fission, and renewable electricity sources.

Proposed Action: Highwood Generating Station – Salem Site

Under this alternative, the HGS would be built and operated approximately eight miles east of Great Falls. The Salem site is located in Sections 24 and 25, Township 21 North, Range 5 East

at about 3,300 feet (1,006 m) above sea level. It is east and north of the intersection of Salem Road and an abandoned railroad bed. In addition, four 1.5-MW wind turbines would be constructed and operated on the same site.

In response to public concern about visual and cultural resources impacts on the NHL, SME has moved the locations of the footprints of the HGS itself and the four wind turbines. The footprint of the power plant has shifted about one-half mile south to a location just outside the eastern NHL boundary. However, due to property constraints and the necessity of keeping the wind turbines upwind of the power plant, it was not possible to move the wind turbines outside the NHL; they have been relocated toward the north, and still remain within the NHL.

Construction is estimated to take approximately four years and three months (51 months) from ground breaking to commercial operation of the plant. Construction would begin with site preparation, foundations, and underground utilities, while design of the above-ground mechanical, piping, buildings, structures, and electrical systems is being developed. Site grading and preparation has a planned duration of approximately two months and would be followed by foundation construction, with a planned duration of approximately a year. Using a phased process, boiler and baghouse construction would commence approximately five months after the beginning of the foundation construction and would be completed in approximately two years.

Construction of the four 1.5-MW wind turbines would take place concurrently with power plant construction. The towers are anticipated to have a height of 262 feet (80 m) at the rotor. The wind turbine is expected to have three blades, with an overall diameter of 250-270 feet (77-82.5 m) or radius of 125-135 feet (38-41 m).

In addition to construction of the HGS and wind turbines on the Salem site itself, construction of the following utility facilities and infrastructure would take place in the vicinity: a rail spur, raw water intake at the Morony Reservoir on the Missouri River, raw water pipeline, two 230 kV transmission lines, a new switchyard, potable and wastewater lines, and access roads.

Once construction was completed, plant start-up activities would be initiated with a planned duration of eight months and must be completed before commercial operation of the plant could begin. Plant operation would employ approximately 65 permanent workers. The plant design consists of a CFB boiler, single re-heat tandem compound steam turbine, seven stages of feedwater heating, water-cooled condenser, wet cooling tower, hydrated ash reinjection or equivalent flue gas desulfurization (FGD) system, baghouse, and material handling system. The plant would withdraw and use for cooling approximately 3,200 gallons per minute of water from the Missouri River.

The HGS would purchase sub-bituminous coal from either the Spring Creek or Decker mines in Montana's Powder River Basin (PRB), or other suitable supply from which comparable PRB coal supplies are produced. Coal consumption is estimated to be 300,000 lb/hr or 1,314,000 tons/yr. Coal would be delivered approximately twice a week in 110-car bottom-dump unit trains. Fly ash from the coal combustion process would be disposed of onsite in an engineered monofill, lined with clay.

Limestone and ammonia would be purchased and utilized to reduce air pollutants. Limestone would be consumed at a rate of approximately 5,780 lb/hr or 25,300 tons/yr. Limestone would be delivered to the plant by truck or train from the Graymont Lime Plant and limestone quarry near Townsend, Montana. Ammonia would be consumed at a rate of 239 lb/hr (1,047 tons/yr). Anhydrous ammonia would be purchased and delivered to the plant by rail or by truck.

Electricity from the operation of the proposed HGS would furnish the base load component of SME's proposed integrated power supply portfolio. However, under the Proposed Action, SME and its member cooperatives would continue to purchase power from WAPA as well as continue to invest in energy conservation and efficiency, as mandated since 1997 by the State of Montana in Senate Bill 390. In addition, SME proposes to purchase and/or generate an environmentally preferred product, probably wind energy.

SME has applied for an air quality permit under the Montana Clean Air Act and would comply with the conditions and limits in the final permit. The preliminary determination or draft permit is included in the FEIS. The on-site ash monofill would comply with all requirements of Montana's Solid Waste Management Act; SME intends to apply for a solid waste license once appropriate zoning changes were made even though this facility is exempt under the law.

Alternative Site – Industrial Park Site

The Industrial Park site is located in the southern half of Section 30, Township 21 North, Range 4 East. It is just east of Highway 87, about ¾ mile (1.2 km) north of the Missouri River and ½ mile (0.8 km) east of a mobile home park. The City of Great Falls has designated this site as the Central Montana Agricultural and Technology Park, that is, as an industrial park. Construction and operation of the 250-MW, CFB coal-fired power plant at the Industrial Park site would be very similar to that described for the Salem site, except for the differences described below.

Eight miles (13 km) of new track and railroad bed would be needed, slightly more than the distance for the Salem site. The rail spur would start north of the Missouri River and travel north and west to the plant site. A 4.5-mile (7.2-km) long pipeline (compared to less than three miles for the Salem site) would be needed to transport make-up water from an intake structure on the Missouri River to the plant. Precise locations of transmission line corridors have not yet been determined, though it is likely that one transmission line would go to the Great Falls Switchyard, which is about 5.5 miles east of the Industrial Park site. A second line of 18 miles in length would likely be built to a switchyard installed on the Great Falls to Ovando line. The specific rights-of-way for potable water and wastewater lines have been selected, and are 1.5 and two miles in length, respectively, which are shorter than for the Salem site.

Construction at the Industrial Park site would take the same length of time as at the Salem site, approximately three and a half years, and the workforce would be about the same size – averaging between 300 and 400 workers at any one time with an estimated peak construction workforce approaching 550.

The proposed generating station at the Industrial Park site would include the same equipment and component parts, would be operated identically and would consume the same quantities of raw materials as in the Proposed Action. Disposal of fly and bed ash would not take place onsite at

the Industrial Park site, because of the smaller area. Instead, ash would be shipped away for disposal in an approved landfill or for reuse as an industrial byproduct, or both.
Unlike the Salem site, the Industrial Park site would not include four wind turbines due to space constraints on the site.

As with the Salem site, SME would comply with its air quality limit, but would not apply for a solid waste license as there would be no ash monofill at the Industrial Park site.

Impact Analysis

No Action Alternative

In general, the No Action Alternative would result in no impacts or negligible effects on the environment at either the Salem or Industrial Park sites. The only impacts that would occur at these sites under the No Action Alternative would result from the continuation of existing unrelated actions and trends, such as agricultural activities, the physical expansion of the City of Great Falls, and the movement of traffic. However, since SME would have to purchase electricity from other generation sources in the West in order to supply its members and customers, the No Action Alternative would contribute indirectly and incrementally to cumulative environmental impacts associated with these fuels and forms of generation. While these impacts cannot be specified at this time, they can be reasonably assumed to correspond to the various impacts known to result from different methods of power generation.

The No Action Alternative would entail no impacts on the topography or the geology of the Salem or Industrial Park sites. Negligible to minor, long-term adverse impacts on soils (e.g. erosion, gradual loss of fertility) would occur from existing land use practices (dryland farming).

This alternative would not adversely affect water resources at or near the Salem site or the Industrial Park, though negligible to minor, long-term adverse impacts on water resources would continue from existing agricultural land uses.

The No Action Alternative would not result in any direct air quality impacts on either the Salem or Industrial Park sites. However, it would contribute indirectly and cumulatively to air quality impacts at those power plants from which SME would purchase electricity, although these impacts cannot be specified or quantified.

This alternative would produce no direct impacts on biological resources at either the Salem or Industrial Park sites. It would likely contribute indirectly and cumulatively to impacts on flora and fauna from those power plants from which SME would purchase electricity, although these impacts cannot be specified or quantified.

No direct noise impacts on either the Salem or Industrial Park sites would result from the No Action Alternative. Likewise, neither would it have direct impacts on recreation, cultural resources, visual resources, transportation, farmland and land use, waste management, or human health and safety.

The No Action Alternative would have potential adverse effects on two resource topics covered in the EIS – socioeconomics and environmental justice. Due to the higher electric rates it would likely lead to for SME's members and consumers, the socioeconomic impacts from the No Action Alternative would be potentially significant and adverse. While there would be no direct impact or effect from a power plant on persons living in poverty or children at either the Salem or Industrial Park sites, higher electricity prices could disproportionately affect low-income residential consumers at any of SME's member cooperatives. These adverse impacts are expected to be of moderate magnitude, intermittent-term duration, and small extent, and have a possible likelihood of occurring.

Proposed Action: Highwood Generating Station – Salem Site

Overall impacts of the Proposed Action on **soils** at the Salem site would be adverse and most likely non-significant. The Proposed Action would have negligible to minor impacts on **topography and geology**. Soils impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent, and have a probable likelihood of occurring. The overall rating from construction impacts would be adverse and non-significant. Impacts from operation of the waste monofill would be adverse but non-significant, and of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring.

The overall rating for impacts on **water resources** from the operation phase of the power plant would be adverse and non-significant. Construction of the HGS would likely entail increased stormwater runoff, carrying sediment and contamination loads into surface waters, with the potential for contamination from construction equipment and activities infiltrating area soils and percolating down into the groundwater. Impacts to water quality would be mitigated – reduced but not entirely eliminated – through Best Management Practices (BMPs). Impacts on wetlands and floodplains would be negligible to minor. Water withdrawals from the Missouri River for HGS operation would reduce flows by 0.31% in a worst-case scenario. Effluent would be discharged to the City of Great Falls sewage treatment system rather than directly into the Missouri River, in compliance with applicable pre-treatment requirements of the city. Impacts from power plant operation would be of minor magnitude, long term duration, and medium extent, and have a probable likelihood of occurring.

Overall **air quality** impacts from the Proposed Action would be adverse and most likely non-significant. Heavy equipment tailpipe emissions and fugitive dust would probably entail short-term, minor to moderate degradation of local air quality during construction of the HGS and wind turbines. HGS operations would result in long-term minor to moderate degradation of local air quality. There would be long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition. Off-site impacts on PSD Class I increments and Air Quality Related Values (AQRVs) – regional haze and acid deposition – would likely range from negligible to moderate in intensity. Annual mercury emissions from the HGS would be approximately 36.4 lbs. (16.5 kg) initially, constituting a minor incremental contribution to cumulative state, national, and global mercury emissions. State and national mercury emissions are declining due to new rules and controls; global emissions are still rising. HGS's mercury emissions are unlikely to present unacceptable health risks to humans or wildlife locally or in the state. The HGS would also result in a minor, incremental contribution to the accumulation of atmospheric greenhouse gases, which scientists believe is forcing climate change.

Overall **biological resources** impacts would be adverse and non-significant. The Proposed Action would temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment. It would also eliminate potential habitats, but it would be unlikely to adversely affect state-listed species of concern from permanent removal of vegetation. There would be minor short-term harm to wildlife and vegetation by degrading air quality, as well as minor, localized short-term harm to aquatic biota from degraded water quality. The HGS would result in a long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the access road(s). There is some potential for increased mortality to birds and bats from blade strikes on the four proposed wind turbines at the Salem site. The Proposed Action may also temporarily disturb habitats along water pipeline routes during construction activities, as well as temporarily disturb wetland habitats over a small area along Morony Reservoir for installation of the raw water intake. In sum, impacts on biological resources would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring.

Overall **noise** impacts from the Proposed Action would be minor, localized and long-term; while impacts on Great Falls and Salem area residents would most likely be non-significant, there would be a significant adverse impact on the acoustical environment of the Great Falls Portage National Historic Landmark. Noise levels from the operation of the HGS, including intermittent noise sources, would be audible for several miles from the site. Predicted noise levels are equal to or less than the EPA guideline at the receptor locations around the Salem site. Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 3.1 miles (5 km) from the Salem site. At all receptor locations, the power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA Ldn 55 dBA guideline. Noise from operation of the proposed wind turbines on the Salem site would not appreciably increase overall noise levels at that site; the dominant the dominant noise source(s) associated with the project would be the power plant equipment, not the wind turbines.

Overall **recreation** impacts from the Proposed Action would be adverse and non-significant. Construction and operation of the HGS would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. The Lewis and Clark staging area historic site would be impacted by the Proposed Action.

Overall impact of the Proposed Action on **cultural resources** would be adverse and significant; the significance of these impacts could be reduced but not eliminated by mitigation. The HGS, wind turbines, and related facilities and infrastructure would have an adverse visual effect on the Great Falls Portage National Historic Landmark (NHL). Other cultural properties within the Area of Potential Effect would not be affected by the Proposed Action. It also appears that no Traditional Cultural Properties would be affected. However, constructing transmission lines, water supply and wastewater lines could potentially affect undiscovered cultural resources. In sum, cultural resources impact would be of major magnitude, long-term duration, and medium or localized extent, and have a probable likelihood of occurring. Moving the HGS outside the NHL boundary, but not the wind turbines, would reduce but not eliminate the significance of the Proposed Action's adverse impact. As a result of Section 106 consultation, SME has also offered to implement a number of off-site mitigations, such as acquiring key properties and assisting the Lewis and Clark Interpretive Center in Great Falls.

The overall rating for **visual impacts** from the Proposed Action would be adverse and significant. The HGS and wind turbines would have scenic impacts of major magnitude, long-term duration, and small extent, and have a high probability of occurring. While the HGS and wind turbines would clearly diminish scenic values within the Great Falls Portage NHL, they would not eliminate them; certain views would remain unaffected. Proposed mitigation measures, such as landscaping and compatible earth-tone color schemes, as well as shifting the HGS to a site just outside the NHL boundary, could reduce the significance of the visual impacts somewhat, but not to a level of non-significance.

The overall rating for impacts on long-term **traffic** congestion from the Proposed Action would be non-significant and adverse. Construction-related impacts on traffic would be of moderate magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. According to Montana Department of Transportation criteria, short-term construction-related impacts would be significantly adverse; a mitigation plan will be developed to minimize these impacts. Over the long term, during operation of the proposed HGS and wind turbines, impacts on road, rail and air transportation would be generally negligible.

Overall rating for impacts on **farmland and land use** at the Salem site would be adverse and while impacts would most likely be non-significant, there is some potential for impacts to become significant. Construction of a power plant at the Salem site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. No homesteads or residences would be displaced. In the context of the amount of quality farmland in other areas of Cascade County, the impact of converting farmland to developed land required for the plant would be of minor magnitude, long-term (permanent) duration, and medium extent, and have a probable likelihood of occurring. Overall rating for impacts on land use from the construction phase of the power plant would be adverse and non-significant. Operation of the power plant at the Salem site would cause no additional direct impacts to land use or farmland. However, the power plant and its associated support facilities could indirectly influence land uses on adjoining or nearby properties in the vicinity of the site. Development of the Salem site may reduce market values of nearby rural, agricultural land, affecting sales of those lands. Property values are less likely to be affected, but if they are reduced then there would be repercussions on land assessments and property taxes.

The overall rating for impacts on **waste management** from the operational phase of the power plant at the Salem site would be adverse; impacts would likely be non-significant. Construction-related impacts on waste management would be of minor magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. Ash and water treatment system byproducts would be disposed of in an onsite monofill, which would be managed with appropriate environmental controls, including groundwater monitoring. Operation-related impacts would be of moderate magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring.

Overall **health and safety** impacts of the plant would be adverse but non-significant. Construction-related impacts at the Salem site would be of minor magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. Operation-related

impacts on human health and safety for the Salem site would be of minor magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring.

Construction of the HGS would have a moderately beneficial effect on the **socioeconomic environment** of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During the long term operation of the HGS, it would yield beneficial and potentially significant socio-economic impacts on aggregate income, employment, and population in Great Falls and Cascade County. The HGS would also provide reliable electricity at reduced rates for SME's customer base.

The Proposed Action would have a negligible effect on children or persons living in poverty, as these population groups are not generally present at or near the Salem site.

Alternative Site – Industrial Park Site

Overall impacts of constructing and operating the proposed power plant at the alternative Industrial Park site would in many respects be comparable to those of the Proposed Action at the Salem site, with some important exceptions, as noted below. In general, the closer proximity of the Industrial Park site to residential areas on the northern edge of Great Falls is a disadvantage of this alternative.

The impacts of plant operation on **soils** at the Industrial Park site would be adverse and non-significant. Nevertheless, since the amount of ash waste would not change, an alternative disposal site would have to be located. Impacts to soils at a new location are unknown and site-dependent. The alternative site, like the Proposed Action, would have negligible to minor impacts on **topography and geology**. Soils impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent, and have a probable likelihood of occurring. The overall rating from construction impacts would be adverse and non-significant. Operation-related impacts on soil resources would be adverse but non-significant, and of minor magnitude, short-term duration, and small extent, and have a possible likelihood of occurring.

The overall rating for impacts on **water resources** from the operation phase of the power plant at the alternative site would be adverse and non-significant. Construction of the HGS would likely entail increased stormwater runoff, carrying sediment and contamination loads into surface waters, with the potential for contamination from construction equipment and activities infiltrating area soils and percolating down into the groundwater. Impacts to water quality would be mitigated – reduced but not entirely eliminated – through Best Management Practices (BMPs). Impacts on wetlands and floodplains would be negligible to minor. Water withdrawals from the Missouri River for HGS operation would reduce flows by 0.31% in a worst-case scenario. Effluent would be discharged to the City of Great Falls sewage treatment system rather than directly into the Missouri River, in compliance with applicable pre-treatment requirements of the city. Impacts from power plant operation at the alternative site would be of minor magnitude, long term duration, and medium extent, and have a probable likelihood of occurring, the same as they would be at the Salem site.

Overall **air quality** impacts from the power plant at the alternative site would be adverse and most likely non-significant, but with the potential to become significant. Heavy equipment tailpipe emissions and fugitive dust would probably entail short-term, minor to moderate degradation of local air quality during construction of the HGS and wind turbines. HGS operations would result in long-term minor to moderate degradation of local air quality. There would be long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition. Off-site impacts on PSD Class I increments and Air Quality Related Values (AQRVs) – regional haze and acid deposition – would likely range from negligible to moderate in intensity. Annual mercury emissions from the HGS would be approximately 36.4 lbs. (16.5 kg) initially, constituting a minor incremental contribution to cumulative state, national, and global mercury emissions. State and national mercury emissions are declining due to new rules and controls while global emissions are still rising. HGS's mercury emissions are unlikely to present unacceptable health risks to humans or wildlife locally or in the state. The HGS would also result in a minor, incremental contribution to the accumulation of atmospheric greenhouse gases, which scientists believe is forcing climate change.

Overall **biological resources** impacts from developing the alternative site would be adverse and non-significant. The Proposed Action would temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment. It would also eliminate potential habitats, but it would be unlikely to adversely affect state-listed species of concern from permanent removal of vegetation. There would be minor short-term harm to wildlife and vegetation by degrading air quality, as well as minor, localized short-term harm to aquatic biota from degraded water quality. The HGS would result in a long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the access road(s). The Proposed Action may also temporarily disturb habitats along water pipeline routes during construction activities, as well as temporarily or disturb wetland habitats over a small area on the Missouri River for installation of the raw water intake. In sum, impacts on biological resources would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring.

Overall **noise** impacts at the alternative site would be minor, localized and long-term; while these impacts would most likely be non-significant, there is some potential for them to become significant, especially if nearby residential development continues. Noise levels from the operation of the power plant, including intermittent noise sources, would be audible for several miles from the site. Predicted noise levels are equal to or less than the EPA guideline at the receptor locations around the Salem site. Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 1.2 miles (1.9 km) from the Industrial Park site. At all receptor locations, the power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA Ldn 55 dBA guideline.

Overall **recreation** impacts from the alternative Industrial Park site would be adverse and non-significant. Construction and operation of the SME power plant at the alternate Industrial Park site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. Upper portions of the proposed generating station would be visible to park users and recreationists along the Missouri River in Great Falls.

The overall impact on **cultural resources** of developing the power plant at the alternative site is likely to be negligible to minor. It would likely have no effect on cultural resources at the site proper due to their apparent absence from the Industrial Park site. It also appears that no Traditional Cultural Properties would be affected at the site proper. However, constructing transmission lines, water supply and wastewater lines could potentially affect undiscovered cultural resources.

The overall rating for **visual impacts** from the alternative Industrial Park site would be adverse and non-significant. It would have scenic impacts of moderate magnitude, long-term duration, and medium or localized extent, and have a high probability of occurring.

The overall rating for impacts on long-term **traffic** congestion from the alternative site would be non-significant and adverse. Construction-related impacts on traffic would be of moderate magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. According to Montana Department of Transportation criteria, short-term construction-related impacts would be significantly adverse; a mitigation plan would be developed to minimize these impacts. Over the long term, during operation of the proposed SME power plant, impacts on road, rail and air transportation would be generally negligible.

Overall rating for impacts on **farmland and land use** at the Industrial Park site would be adverse and non-significant, but with some potential for the impacts to become significant. Construction of a power plant at this site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. No homesteads or residences would be moved. In the context of the amount of quality farmland in other areas of Cascade County, the impact of converting farmland to developed land required for the plant would be of minor magnitude, long-term (permanent) duration, and medium extent, and have a probable likelihood of occurring. Overall rating for impacts on land use from the construction phase of the power plant would be adverse and non-significant. Operation of the power plant at the alternative site would cause no additional direct impacts to land use or farmland. Indirectly, however, the greater proximity of residential areas and other businesses to the Industrial Park site could potentially create more land use conflicts than at the Salem site. Development of the Industrial Park site may reduce market values of nearby agricultural or residential land, affecting sales of those lands. Property values are less likely to be affected, but if they are reduced then there would be repercussions on land assessments and property taxes.

The overall rating for impacts on **waste management** from the operational phase of the power plant at the alternative site would be adverse; while impacts might likely be non-significant, there is some potential for impacts to become significant. Construction-related impacts on waste management would be of minor magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. All non-hazardous waste generated during operation of the power plant, including ash, would be disposed of at the High Plains Sanitary Landfill and Recycle Center north of Great Falls. Operation-related impacts on waste management for the Industrial Park site would be of minor to moderate magnitude, long-term duration, and small extent, and have a probable likelihood of occurring.

Overall **health and safety** impacts of building and operating the power plant at the alternative site would be adverse most likely non-significant. Construction-related impacts at the Industrial

Park site would be of minor magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. Operation-related impacts on human health and safety for this site would be of minor magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring.

Construction of the SME power plant at the Industrial Park site would have a moderately beneficial effect on the **socioeconomic environment** of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During the long term operation of the power plant, it would yield beneficial and potentially significant socio-economic impacts on aggregate income, employment, and population in Great Falls and Cascade County. The power plant would also provide reliable electricity at reduced rates for SME's customer base.

This alternative's overall impacts related to **environmental justice and protection of children** would be adverse but non-significant. There is some potential of a slightly increased risk of impacting children and persons living in poverty from this site, due to the fact that it is located in closer proximity to higher population areas and additional industrial sites. These impacts are judged to be of minor magnitude, long-term duration, and medium extent, and have an improbable likelihood of occurring.

Agencies' Preferred Alternative

USDA Rural Development's and DEQ's preferred alternative is the Proposed Action – the Highwood Generating Station at the Salem site.

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HIGHWOOD GENERATING STATION
Final Environmental Impact Statement

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1.0 INTRODUCTION

This chapter explains what this document is, who prepared it, and why. This chapter also explains the need for electrical power that Southern Montana Electric seeks to satisfy by building a coal-fired power plant and installing four wind turbines. Chapter 2 describes that proposed action along with alternative courses of action considered for meeting the identified purpose and need. Chapter 3 then describes the affected environment of the proposed action and two alternatives. Chapter 4 assesses the potential environmental impacts of the proposed action and alternatives while Chapter 5 considers possible cumulative impacts. This Environmental Impact Statement (EIS) also includes several appendices.

In response to public comments, RUS and DEQ have made several minor changes in Chapter 1 summarized in the italicized bullets below. Any additions or changed text in the Final EIS (FEIS) from the Draft EIS (DEIS) as a result of public comments are shown in double underlining. Deletions are not shown. The main changes in Chapter 1 are:

- *Montana Department of Transportation has been added to Section 1.2, Key Agency Roles, Responsibilities, and Decisions.*

- *A description of public participation during the DEIS comment period and a summary of changes made to the FEIS as a result of this participation has been added.*

- *A description of forthcoming opportunities for public participation has been updated.*

1.1 THE PROPOSED ACTION

The Southern Montana Electric Generation and Transmission Cooperative, Inc. (SME) proposes to build a 250-megawatt (MW) coal-fired power plant and 6 MW of wind generation at a site near Great Falls, MT. This EIS discusses this Proposed Action and analyzes the potential effects that SME's action could have on the environment.

SME is based in Billings, Montana. As an Electric Generation and Transmission Cooperative, it is a non-profit utility owned by its members. As such, it provides wholesale electricity and related services to five electric distribution cooperatives and one municipal utility. The SME member systems are:

- Beartooth Electric Cooperative, Inc., headquartered in Red Lodge, Montana.
- Fergus Electric Cooperative, Inc., headquartered in Lewistown, Montana.
- Mid-Yellowstone Electric Cooperative, Inc., headquartered in Hysham, Montana.
- Tongue River Electric Cooperative, Inc., headquartered in Ashland, Montana.
- Yellowstone Valley Electric Cooperative, Inc., with headquarters at Huntley, Montana.
- Electric City Power, Great Falls, Montana.

SME's 58,000-square mile (150,220-square kilometer) service area encompasses 22 counties in two states – Montana (Figure 1-1) and a very small area of Wyoming. SME's total electric load requirement consists of the combined system needs of the five electric distribution cooperative members and one municipal utility. Under its charter, SME is required to meet the electric power needs of the member systems it serves. As the next section discusses, SME does not have the capacity to meet all of its members' power needs beyond roughly 2010. After considering various ways to meet those future needs (see Section 1.2), SME identified the construction of a new coal-fired power plant supplemented with four wind turbines as its best course of action to meet the electric energy and related service needs of up to approximately 120,000 Montanans upon completion.

1.2 KEY AGENCY ROLES, RESPONSIBILITIES AND DECISIONS

1.2.1 USDA RURAL DEVELOPMENT, UTILITIES PROGRAMS

SME has applied for a loan guarantee for generation and transmission (G & T) borrowers' lending to construct this facility from the Rural Utilities Service (RUS). The Federal Financing Bank (FFB) provides the actual loan dollars and RUS guarantees the repayment of the money to FFB. RUS is an agency which administers the U.S. Department of Agriculture's Rural Development Utilities Programs (USDA Rural Development (RD)).

Under the authority of the Rural Electrification Act of 1936, RD Electric Programs makes direct loans and loan guarantees to electric utilities to serve customers in rural areas. Among other things, these loans and loan guarantees finance the construction of electric distribution, transmission, and generation facilities, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Loans are made to corporations, states, territories and subdivisions and agencies such as municipalities, citizen utility districts, and cooperatives, nonprofit, limited-dividend, or mutual associations that provide retail electric service needs to rural areas or supply the power needs of distribution borrowers in rural areas.

RD has established procedures for determining if proposed projects for which loans are sought are feasible both from an engineering and financial perspective. As part of the loan application process and prior to preparing this EIS, SME was required to prepare three studies: an Alternative Evaluation Study, a Siting Study, and a Macro-Corridor Study (7 CFR 1794.51(c)). These studies were available to the public prior to the scoping meetings held in Great Falls.

Subject to the completion of all environmental review requirements and loan requirements, RD's decision on this proposal is whether to finance the proposal.

1.2.2 U.S. ARMY CORPS OF ENGINEERS

SME's proposal to install an intake structure and pipe in Morony Pool in the Missouri River will require a permit under Section 10 of the Rivers and Harbors Act. The Corps is the permitting authority for the installation of any structure or work on, over, under or affecting navigable waters. SME has submitted a Section 10 permit application to the Corps for its Proposed Action.

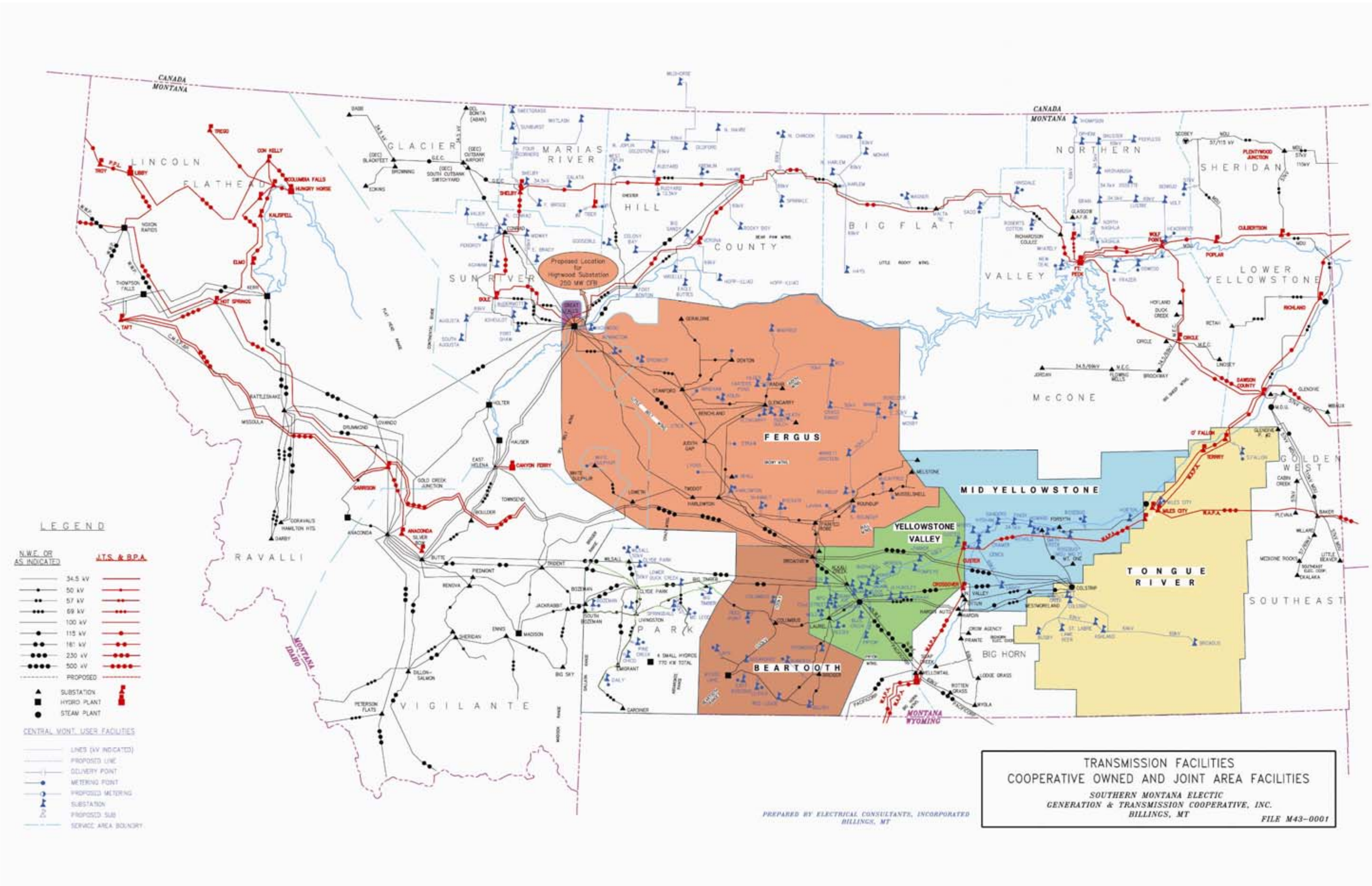


Figure 1-1. Southern Montana Electric (SME) Generation and Transmission Cooperative Service Area in Montana

1.2.3 NATIONAL PARK SERVICE (NPS)

NPS administers the National Historic Landmark (NHL) program and the Lewis and Clark National Historic Trail. The proposed site is in the vicinity of the Great Falls Portage NHL.

1.2.4 MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

The Montana legislature has passed statutes defining the requirements for construction and operation of a transmission line, discharge of process and storm waters, discharge of emissions, storage of hazardous and solid wastes, and development and operation of public water supply and sewer systems. The DEQ is required to evaluate the permit, certificate, and license applications submitted by SME under the following major laws and regulations:

- The **Montana Environmental Policy Act (MEPA)** (75-1-101 *et seq.*, MCA and ARM 17.4.601 *et seq.*) requires an environmental review when making decisions or planning activities that may impact the environment. The MEPA and regulations define the process to be followed when preparing an environmental assessment (EA) and an EIS.

- The **Montana Clean Air Act** (75-2-101 *et seq.*, MCA) requires a permit for the construction, installation, and operation of equipment or facilities that may cause or contribute to air pollution.

- The **Montana Water Quality Act** (75-5-101 *et seq.*, MCA) regulates the discharge of pollutants into state waters through the adoption of water quality standards and the permit application process. Water quality standards specify what changes in water quality are allowed during the use of state waters and establish a basis for wastewater and storm water discharge permitting. This act also includes the provisions for short-term waivers for turbidity during construction and Section 401 Certification.

- The **Montana Solid Waste Management Act** (75-10-201 *et seq.*, MCA) regulates the disposal of solid wastes. A license is required to construct a landfill. On-site disposal of fly ash from power plants is excluded from this requirement; however, SME has voluntarily agreed to meeet landfill standards for the proposed on-site fly ash monofill.

1.2.5 MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION (DNRC)

The Montana Department of Natural Resources and Conservation (DNRC) administers several statutes and regulations that may pertain to SME's proposed HGS and related facilities, such as the electrical transmission and raw water lines:

- The Montana Water Use Act (85-2-101 *et seq.*, MCA) regulates the issuance of new appropriations of water and changes to existing water rights.

- The Montana Floodplain and Floodway Management Act (76-5-401 through 406, MCA) requires a permit for new construction within a designated l00-year floodplain.

- The Conservation Districts Bureau of DNRC administers the Montana Natural Streambed and Land Preservation Act (75-7-101 *et seq.*, MCA). Any non-governmental entity that proposes to work in or near a perennially flowing stream on public or private land in which any activity may physically alter or modify the bed or banks requires a 310 permit.

- A Montana land-use license or easement on navigable waters is required for any project on lands below the low water mark of navigable waters.

The DNRC will decide on authorizing a change in point of diversion and place of use for the existing water reservation of the City of Great Falls. DNRC may deny an application to change a water right if the applicant does not meet the criteria under 85-2-402, MCA. Other DNRC or delegated agency decisions include need for a Floodplain Development Permit and a decision on a 310 Permit.

1.2.6 Montana State Historic Preservation Office

The State Historic Preservation Office (SHPO) cooperates with and advises federal and state agencies when a proposed project could affect potentially significant historical, archaeological, or other cultural resources. The SHPO provides federal agencies with site value recommendations for cultural resources eligible for the National Register for Historic Places. If approved, the lead agencies would oversee compliance with historic preservation and monitoring plans.

1.2.7 Montana Department of Fish, Wildlife and Parks

The Montana Department of Fish, Wildlife and Parks (FWP) is responsible for the use, enjoyment, and scientific study of the fish in the Missouri River and other project area watercourses. FWP also administers the Stream Protection Act, and cooperates with the DEQ in water quality protection.

1.2.8 Montana Department of Transportation

The Montana Department of Transportation (MDT) has jurisdictional authority for issuing encroachment and occupancy permits for pipelines, rail lines or utilities (overhead and underground) within State Highway right of way. In addition, MDT has authority for issuing approach permits for roads and approaches that directly access State maintained right of way. Finally, MDT must review and approve any proposed modifications to the Federal-aid eligible highway system. As per MCA 60-2-111, the Montana Transportation Commission must let all contracts on the Federal-aid eligible highway system, or delegate authority to let contracts on this system to MDT or a local government agency.

SME has initiated discussions with MDT regarding permit requirements and development of a traffic mitigation plan. MDT would require that the necessary permits and mitigation plan be completed prior to any construction.

1.3 NEPA AND MEPA PROCESSES

USDA must comply with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code (USC) 4321 et seq.) and its implementing regulations from the Council on Environmental Quality (40 Code of Federal Regulations (CFR) 1500-1508), and from USDA's Rural Utilities Service's Environmental Policies and Procedures (7CFR 1794).

In cases such as this, NEPA requires that the responsible agency:

- identify the purpose and need to be met;
- identify the available courses of action to meet that need, including no action;
- identify, evaluate and compare the impacts on the environment that could arise from each of the reasonable alternatives;
- publish this information in an EIS for review by the public and other agencies;
- consider the impacts, ways to lessen or avoid them, and public and agency comments, before making its decision on the proposal.

Under Montana's MEPA (Title 75, Chapter 1, MCA), a state law very similar to NEPA, DEQ must conduct an environmental impact analysis before deciding about issuing the discharge and emissions permits SME's power plant would need. In addition to the above NEPA requirements, MEPA requires DEQ to:

- list and describe the responsibilities of federal, state, and local agencies that have jurisdiction over some aspect of the Proposed Action;
- describe potential growth-inducing or growth-inhibiting impacts;
- describe the economic and environmental benefits and costs of the Proposed Action;
- describe the relationship between local short-term uses of man's environment and the effect on maintenance and enhancement of the long-term productivity of the environment;
- evaluate the effects of regulatory restrictions on private property.

Because of the similarity of NEPA and MEPA and their joint need to prepare EISs, USDA and DEQ have decided to jointly prepare and issue this EIS to meet the needs of both agencies and the requirements of both NEPA and MEPA. USDA and DEQ selected an independent contractor with no ties to Southern Montana Electric, and directed the contractor's preparation of this EIS, in accordance with RD regulations.

ABOUT ENVIRONMENTAL IMPACT STATEMENTS

An EIS is intended to help agencies make environmentally well-informed decisions about major actions. It focuses on providing the specific information – on the proposed action, alternatives, and impacts – that is relevant to the agency's decision making.

The EIS answers major questions such as:

- What is the need to be met?
- In what ways could the need be addressed?
- How would these courses of action affect the environment?
- What could be done about those effects?
- What do others think about these alternatives and their impacts?

Preparing an EIS involves several steps, including a "scoping" process at the outset. In scoping, the responsible agency asks other agencies, organizations and the public for input concerning the planned EIS. Later, when the EIS is published as a draft, the agency again invites outside comments, which are reflected in the final EIS, which is published prior to the agency's making a decision. The public may again comment on the final EIS under NEPA.

1.4 PURPOSE, NEED FOR, AND BENEFIT OF THE ACTION

At present, SME meets all of its requirements to provide power to its member systems by purchasing power from two Federal power suppliers. However, its major supplier will end its sales of power to SME by 2011. This forces SME to seek a way to close the large projected gap between the amount of power it can provide to its member systems and the amount of power those member systems need to supply their residential, commercial and industrial customers.

It should be noted that the RD application covers the financing needs of the five cooperative members of SME, representing approximately 75 percent or 185 MW of the total projected load needs of only SME (Table 1-1). Electric City Power (a Montana non-profit corporation formed by the City of Great Falls to provide electric service to its customers), representing approximately 25 percent or 65 MW of the load needs of SME, is financing its share of the facility through issuance of revenue bonds (RW Beck, 2004). While the RD loan will cover approximately 75 percent of the cost of the facility, this joint EIS evaluates the purpose and need and environmental impacts associated with the entire 250-MW facility, particularly since NEPA and MEPA require evaluation of the entire project.

Currently, approximately 20 percent or 20 MW of the cooperative member systems' wholesale supply requirements are met through a power purchase agreement with the Federal Western Area Power Administration (WAPA). The remaining 80 percent or about 100 MW is met by purchase from the Bonneville Power Administration (BPA) under an "all supplemental requirements" contract effective from 2000-2017. The wholesale power requirements of Electric City Power are met with purchases from PPL Montana that will expire in 2011.

A provision of SME's power purchase agreement with BPA allows "recall" of a portion of SME's purchase rights beginning in 2008, and the remaining power purchase rights of the contract by 2011. BPA has now exercised this provision because it has determined that the load requirements of the region which it has a statutory requirement to serve will have needs in excess of its current generating capacity. Under the laws governing BPA, SME is an "extra-regional" customer because it is located east of the continental divide.

ELECTRICAL UNITS

Watt: A watt is a measure of power, or the rate at which work is done. One watt equals one joule (a unit of energy) per second. Another measure of power is horsepower, with 1 horsepower theoretically equal to 746 watts.

Kilowatt (KW): 1 thousand watts

Megawatt (MW): 1 million watts

Megawatt-hour (MWh): A megawatt-hour is a measure of the total amount of energy delivered, or used. One megawatt hour is a power of one megawatt used for one hour.

SME has unsuccessfully sought to persuade BPA to reconsider its decision. SME will experience an approximate 50 MW reduction in its power purchase rights with BPA in 2008 (SME, 2004a). After 2011, when SME's power purchase rights with BPA will fully expire, SME will lose approximately 160 MW of power supply.

Table 1-1. SME's Cooperative Member Systems Requirements: Peak Demand in MW, 2004-2018[8]

Year	Estimated System Peak[1]	WAPA[2]	Wind or EPP[3]	Option 1 less WAPA[4]	System Peak 2003 L.F.[5]	Option 2 less WAPA[6]	BPA Residual	Max. Required[7]
2004	106	20	1	85	110	89		0
2005	132	20	1	111	136	115		0
2006	136	20	1	115	140	119		0
2007	145	20	1	124	149	128		0
2008	154	20	1	133	159	138	93	45
2009	165	20	1	144	170	149	33	116
2010	168	20	1	147	174	153	31	122
2011	172	20	1	151	177	156	29	127
2012	175	20	1	154	181	160	0	160
2013	179	20	1	158	185	164	0	164
2014	183	20	1	162	189	168	0	168
2015	187	20	1	166	193	172	0	172
2016	191	20	1	170	197	176	0	176
2017	195	20	1	174	201	180	0	180
2018	199	20	1	178	205	184	0	184

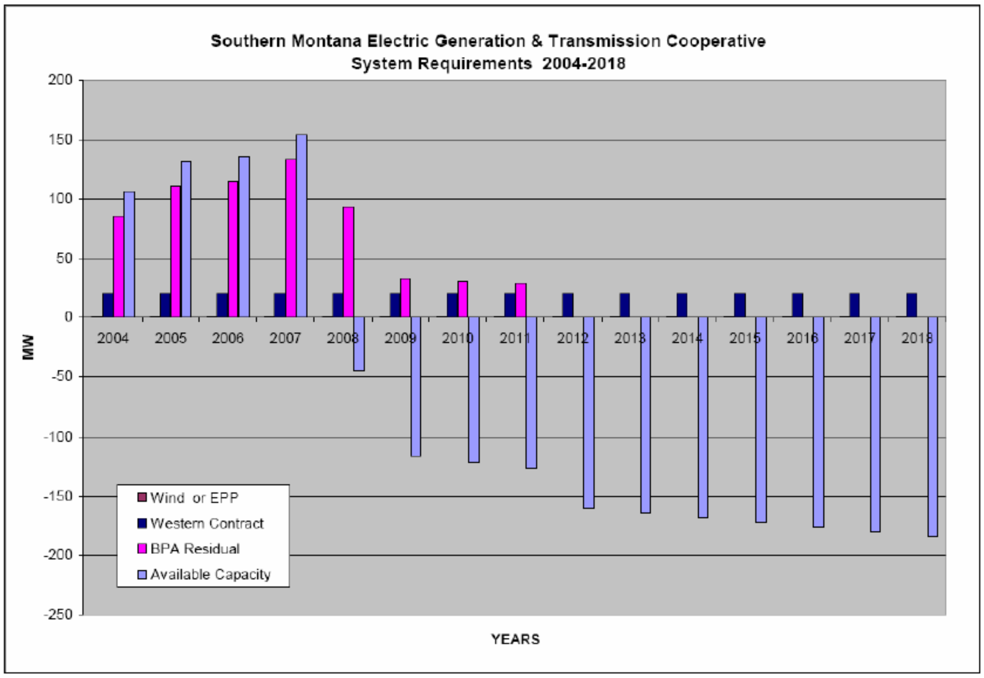
Source: SME, 2004d

[1] Estimated System Peak calculated by using the estimated usage in kWh and the Average System Load Factor for the period 2001 through 2004
[2] Unadjusted
[3] Environmentally Preferred Product
[4] Peak demand projection based on average system load factor for period 2001-2004 less Western Area Power Administration (WAPA) and EPP. Option 1 represents the estimated peak demand for the cooperative member systems calculated by using the average system load factor for the period 2001 through 2004 less the residual power purchase rights from the WAPA.
[5] Annual system load factor for 2003. This column shows the estimated peak system requirements prior to subtracting the residual power purchase rights from the WAPA. As was stated in the Load Forecast, SME's ability to make purchases from the WAPA has been (and will continue to be) reduced from time to time unilaterally by WAPA. Based on this demonstrated pattern – in fact SME's purchase rights were reduced slightly beginning January 2006 – SME needs to keep in mind it could lose entirely its right to make purchases from WAPA. This column represents an estimate of SME's peak demand requirements if WAPA was to completely remove SME's purchase rights. SME also needs to recognize that there have been efforts in the past to sell the Power Management Authorities and that it could happen again.
[6] Peak demand projection based on annual system load factor for 2003 less WAPA and EPP. Option 2 represents the estimated peak demand calculated by using only the system load factor for the year 2003 less the residual purchase right from WAPA.
[7] Maximum requirement represents total demand requirement less residual BPA purchase rights
[8] Options 1 and 2 were developed to demonstrate an improvement in member system load factor and the impact that effort had on projected capacity requirements. Option 2 was ultimately selected as the preferred option because it was believed to more accurately represent the anticipated load factor over an acceptable planning horizon as manifested in peak demand for SME. Their member systems have focused on improving their load factors and it was determined that the load factor for 2003 would more accurately represent an anticipated load factor for planning purposes. Option 1 was left in to simply demonstrate that more than one option was considered in the context of the planning process.

The demand for power from SME is projected to increase over the course of the next several years. SME's cooperative member systems project an increase in electric power demand to approximately 180 MW by 2017 (Table 1-1). Therefore, the160 MW that will no longer be available from BPA will clearly cause a major shortfall, as will the expiration of SME's contracts with PPL Montana on behalf of Electric City Power for approximately 65 MW. Moreover, SME's only other power supplier, WAPA, also has the contractual right to reduce its supply to SME, and has made reductions in the past.

SME faces an imminent wholesale power supply shortfall of major proportions. Figure 1-2 depicts this deficit graphically. While this deficit will have to be made up in the next few years by purchasing power from other sources, SME seeks a lower cost solution for the long term that will ensure its ability to provide affordable, reliable, quality electric energy and related services to its six member systems.

Figure 1-2. Upcoming Capacity Deficit Faced by SME's Cooperative Member Systems



Source: SME, 2004a

1.4.1 ESTIMATED ELECTRIC LOADS OF COOPERATIVE MEMBER SYSTEMS

This section explains how much electric power SME projects it will need to provide to its member customers, and shows that the demand will be increasing at the same time that SME's power supply will be decreasing.

SME must provide power to its member cooperatives, which have no power supplies other than what they obtain from SME. In the next several decades, SME projects that its electric load will in fact increase. This will be primarily due to increases in residential customers (which includes both urban and farm customers), and in commercial and industrial customers. There are also

several minor contributors to system load, including irrigation, water treatment facilities, street and highway lighting, public schools and municipal buildings. SME used historic usage served as the primary tool for load forecasting (SME, 2004a).

1.4.1.1 Residential

The demand for electricity for residential customers is expected to increase for several reasons: increasing population and increasing use of electricity per household.

Historically, residential loads have accounted for approximately 67 percent of projected total sales made by SME to its member cooperatives. The number of residential customers served by the member systems of SME has been increasing at an annual rate of approximately 1.75 percent over the last 10 years, with most of this growth due to residential subdivisions being developed on the peripheral edges of Billings, Montana in Yellowstone Valley Electric Cooperative's service territory. The annual growth rate in the number of residential customers ranges widely among SME's member cooperatives – from less than 0.5 percent in Mid-Yellowstone Electric Cooperative's service territory to approximately 4 percent in Yellowstone Valley Electric Cooperative's service territory (SME, 2004a).

SME projects a system increase in residential customers of approximately 2.5 percent annually over the next 20 years. The main factor behind this increase will be the continued expansion of the City of Billings into the area served by Yellowstone Valley Electric Cooperative. SME also anticipates additional growth in the residential customer segment of the member systems it serves in some of the more attractive rural locations in close proximity to areas known to offer recreational and "quality" lifestyle opportunities. As a general rule where there is a combination of "trees, scenery and water" there will be population growth in Montana and the Rocky Mountain West generally. If these qualities are absent there is little or no growth (SME, 2004a).

The average amount of electricity used per residential customer is expected to remain relatively constant to increasing slightly over the course of the next 20 years. Factors influencing individual residential customer use of electricity are the following:

- Steady to a moderate decrease in electricity use for household heating, due to more efficient heating appliances.
- Increased use of air conditioning
- Steady to a moderate decrease in electricity use for water heating due to more efficient water heaters.
- More efficient refrigerators and freezers
- More efficient lighting
- Increased electricity use by "farm customers," resulting from an increase in farm size and enhanced mechanization.

In addition to traditional load growth, SME anticipates a continued increase in the use of air conditioning and a reduction in the number of homes selecting natural gas as a home heating fuel. Recent and expected future increases in the price of natural gas have seriously undercut the economic advantage natural gas previously enjoyed as the fuel of choice for home heating purposes. In fact, if the rapid increase in the price of natural gas continues, while electric prices

remain stable or increase at a more gradual pace, there may be an increase in the number of homes using electric heat. This increase in the use of electric heat would most likely come in the form of high-efficiency, electric heat pumps, which offer the added advantage of air conditioning (SME, 2004a).

Taking into account the above projected changes in the total number of residential customers and the mean electricity consumption per customer, total electricity sales to SME's residential customers are projected to increase 3.3 percent per year over the next 10 years. Once the already planned developments in the Billings, Montana and Clark, Wyoming areas are built, SME anticipates the surge in growth will subside. Future load growth is expected to return to more traditional levels (SME, 2004d).

Due to increased industrial activity currently underway in Fergus Electric's service territory and planned methane gas development in Tongue River Electric's service territory, the residential customer load is expected to decline from 67 percent to approximately 56 percent of SME's service obligation for the period 2003-2018. The bulk of that shift is expected in the period 2003-2008.

1.4.1.2 Commercial and Industrial

SME partitions its commercial and industrial customers into "small commercial" and "large commercial" classifications. The small commercial customer classification includes restaurants, retail stores, "cottage industries," and small manufacturing facilities. Large commercial customers are mostly larger manufacturing facilities, industrial sites and facilities with sizable motor loads such as compressor stations. The number of small commercial and industrial customers is projected to increase by 1.5 percent per year over the next 20 years. For the period 2003-2018, SME anticipates a 1.7 percent annual increase in the wholesale energy requirements of the member systems' small commercial loads (restaurants, retail stores, "cottage industries," and small manufacturing facilities). This increase would be in line with projected growth in the region for petroleum product extraction and the continued growth in the development of the methane gas wells in southeastern Montana in Tongue River's service area.

If the efforts now being undertaken by local governmental agencies like the City of Great Falls are successful in encouraging industrial development and strong regional economic growth, the projected increases in the load requirements of the member systems for small commercial and industrial customers would need to be adjusted upward accordingly. For the purpose of this needs analysis, a more conservative approach has been taken in projecting the future load requirements of the small commercial and industrial customer sector. In order for a load to be considered in the context of this analysis, there must be considerable assurance that the load is likely to develop.

Although SME does not expect a dramatic increase in the consumption rates of small commercial and industrial users of electricity on a per customer basis, it does anticipate a significant increase in the overall requirements of these customer classes. This increase has been the result of two large pumping stations on Fergus Electric's system and the expected growth in the coal bed methane gas industry in Tongue River Electric's service area located in close

proximity to the Powder River Basin (PRB) coal fields. Fergus Electric received a deposit to construct these two pumping stations, which serve approximately 16,000 horsepower of new load. The impact of the installation of this large pumping load, in conjunction with ongoing methane gas development, represents a projected increase in sales to the large commercial segment of SME's load base of approximately 40 percent over the 2003-2008 time frame.

Tongue River Electric Cooperative projects the development of the methane gas industry to result in an additional large commercial load requirement of 3,000 horsepower in 2007, 3,000 horsepower in 2008 and 4,000 horsepower in 2009. This methane gas load development in Montana reflects the established trend in other nearby regions such as northern Wyoming. The near future is likely to bring further natural gas development in the Rocky Mountain States. Based on assessments conducted between 1987 and 1999 by the U.S. Department of Energy (DOE) and the U.S. Geological Survey (USGS), DOE concludes that the Rocky Mountain States in general possess "enormous" volumes of natural gas, almost 7,000 trillion cubic feet (Tcf), although only a small fraction is technically recoverable (DOE, 2003a). One Tcf is enough natural gas to heat 15 million homes for one year. Five Rocky Mountain States (Colorado, New Mexico, Utah, Wyoming and Montana) now account for 27 percent of proved natural gas reserves; in 2001, Montana accounted for 1 Tcf of the 5-state total of 65 Tcf proved reserves (combined total dry gas/coal bed natural gas) (DOE, 2003a).

SME estimates the total increase in the load requirements of Tongue River's large industrial class to be approximately 10,000 horsepower, or an increase to SME of approximately 25 percent over 2004 requirements. This projection was rather conservative when compared to the actual growth and future projections made by neighboring utilities experiencing similar industrial activity. At one point, Powder River Energy just across the border in Wyoming was predicting its methane gas load at approximately 300 MW, 30 times greater than Tongue River's projection.

LOAD FACTOR

Figure 1-3 is a graph depicting projected growth in SME's member systems' electrical energy requirements by sector. It includes minor sectors such as irrigation, street lighting, and public authorities, which are projected to remain relatively stable or flat over the coming two decades. The units in Figure 1-3 are Megawatt-hours (MWh). A problem inherent to developing a load forecast is making the transition back and forth between MWh and MW. Electric generation capacity is expressed in terms of megawatts. The relationship between megawatt-hours and megawatts of capacity is a variable dependency known as "load factor." Thus, there is not a direct correlation between generation capacity and total energy consumption over a prescribed number of hours because loads are cyclical in nature.

These projected increases in the load requirements of large industrial consumers will contribute substantially to the increase in SME's wholesale power requirements up to 2013. Large industrial customer load ("large commercial" in Figure 1-3) is expected to increase on average approximately 15 percent annually up to 2016. For the period 2013-2018 projected load growth will have almost leveled off to a rate of less than one percent annually. Without the increased load associated with the above two predicted activities, SME would have anticipated a more modest growth rate of approximately 3 percent over the 2003-2009 period.

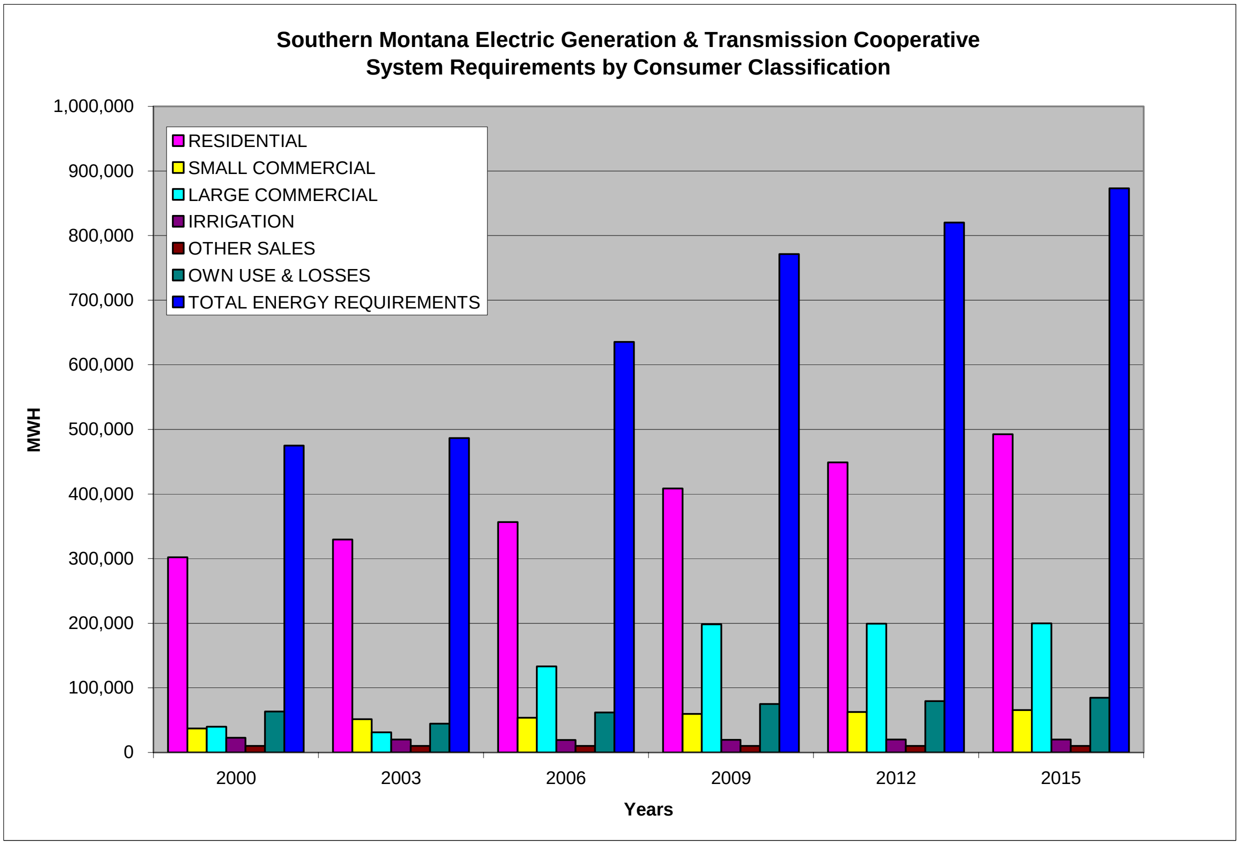
1.4.2 Power Supply

1.4.2.1 Generating-Capacity Mix

The most economical means of supplying the cyclical load on an electric power system is to have three basic types of generating capacity available:

a. Base load capacity
b. Intermediate load range capacity
c. Peaking capacity

Figure 1-3. SME Cooperative Member System Requirements by Customer Classification Through 2015



Base load capacity operates near its full rating continuously, day and night, all year long. It is economical to design these units with a maximum of fuel-economizing features, highest practical steam temperatures and pressures, extensive use of regenerative boiler-feed water heaters, reheat and double-reheat boiler-turbine arrangements, and large condensers with minimum-temperature cooling water. These items increase the cost of the plant but are justifiable because the fuel-cost saving is large due to the large amount of power produced by having the unit run continuously.

The design of the plant is optimized to obtain the balance between high first cost and low fuel cost that will give the lowest overall power cost under the assumption that the unit will be heavily loaded for many years. The best design will vary depending on the unit size, money costs, and fuel type and cost. Base load units are generally the newest, largest, and most efficient of the three types of units (EIA, 2005b).

Peaking capacity is operated only during daily peak-load periods during the seasonal peak times of the year and during emergencies. Because the total annual output is low, high efficiency is not as necessary as for base load units. Low first cost is of prime importance. Combustion turbines and pumped-storage hydro units are the typical peaking units (SME, 2004a).

Intermediate load range capacity fits between the base load capacity and peaking capacity in both first cost and fuel cost. It generally is designed to be "cycled", that is, turned off regularly at night or on weekends and loaded up and down rapidly during the time it is on the line to accommodate the load swings on the system. In other words, intermediate-load units are used during the transition between base load and peak load requirements. Some additional cost is required to allow for repeated starts and stops without equipment damage or the need for larger operating staffs. However, owing to the lower annual production, some reduction in efficiency is justified. Older small base load units and hydro units with restrictions on water use are sometimes used for intermediate and peaking service (SME, 2004a).

As earlier indicated in Section 1.4 above (Purpose, Need for, and Benefit of the Action), SME does not own base load generation and currently meets approximately 80 percent of its cooperative members' wholesale electric energy supply requirements with a power purchase agreement with BPA and the remaining 20 percent through a power purchase agreement with WAPA. By 2011, SME's power purchase rights with BPA will fully terminate, leaving SME with an approximate shortfall of 160 MW. At that time SME will still have residual power purchase rights with WAPA of approximately 20 MW. As noted, WAPA could reduce this power purchase right for a number of reasons. If the WAPA power purchase agreement were to be completely withdrawn, SME would have a projected requirement of approximately 160 MW in 2008, escalating to approximately 180 MW by 2012. Further, Electric City Power of the City of Great Falls, an SME member, will have projected requirements of about 65 MW after 2011.

On the basis of the results of repeated efforts to secure affordable power purchase agreements, SME does not believe that continuing to rely solely on traditional power supply agreements is acting in the best interest of the member systems it serves. Power purchases face market volatility, transmission capacity issues, and the unwillingness of current owners of existing generation to sell the electrical output of their facilities at prices less than "what the market will bear." These represent a compelling reason for SME to seek a supply option that provides a higher level of control over its existing and future supply needs.

1.4.2.2 Natural Gas Supply, Demand and Pricing

SME conducted an extensive search in the power supply market place for a suitable source of electrical energy to meet its member system requirements with a power purchase agreement secured from an existing source of generation within the Western System Coordination Council

(WSCC). The lack of affordable generation capacity in the WSCC, combined with ever-increasing transmission constraints, has cast doubt on the future viability of purchasing capacity from existing sources of wholesale supply. The WSCC, of which SME is a member, has relied completely on very expensive natural gas-fired generation to meet future regional supply requirements. The forward price of a power purchase agreement would closely track the forward price of natural gas, which has been rising sharply in recent years (API, 2005a). With the price volatility of natural gas, plus the fact that the increasing cost of natural gas-fired generation constitutes the future marginal cost for wholesale electric energy and related supply services, the price SME would pay for power supply might be nearly double its current costs. Given this much greater cost, plus difficult or intractable related transmissions issues, negotiating an acceptable power purchase agreement does not appear to be a viable option.

As in much of the country, consumption of natural gas in the Northwestern U.S. has increased markedly since the 1970's. Not only has gas continued its traditional role as the fuel of choice for residential and commercial heating, but it also became the premier fuel for new electricity generation. Virtually all new generation built in the region was combined or simple cycle gas turbines, which were easy to locate, economical, and "environmentally friendly."

Western System Coordination Council (WSCC)

The U.S. bulk power system has evolved into three major networks or power grids. The WSCC is one of these networks. The major networks consist of extra-high-voltage connections between individual utilities designed to permit the transfer of electrical energy from one part of the network to another. These transfers may be restricted by a lack of contractual arrangements or by inadequate transmission capability. The three networks are:

- the Eastern Interconnected System,
- the Western Interconnected System (WSCC), and
- the Texas Interconnected System.

Virtually all U.S. utilities in the contiguous 48 states are interconnected with at least one other utility by these three major grids. The inter-connected utilities within each power grid coordinate operations and buy and sell power among themselves. The bulk power system makes it possible for utilities to engage in wholesale (for resale) electric power trade. Wholesale trade has historically played an important role, allowing utilities to reduce power costs, increase power supply options, and improve reliability.

– *Energy Information Administration, U.S. Department of Energy (EIA, 2005a)*

Rather than develop a more comprehensive, balanced and diversified supply portfolio, the region decided that the benefits of gas fired generation outweighed the risk associated with the inherent volatility in the price of natural gas. As the region has begun to experience in recent winters, the increased supply burden placed on natural gas has produced an unintended consequence. The price of natural gas is increasing at a troublesome rate, affecting not only the price of electricity produced by gas-fired generation, but also the cost to heat homes and businesses. This unintended consequence is most likely to have the greatest adverse affect on those that can afford it least – fixed and low-income families.

In general terms, rising natural gas prices are due to a number of factors, including:

- Strong growth in demand.
- Competing government policies that encourage use of natural gas on one hand but discourage new supplies by restricting access and development of domestic natural gas resources on the other.
- Lack of infrastructure needed to transport more natural gas to market.
- Declining productivity of older fields (API, 2005a; 2005b). Natural gas well productivity peaked at 435 thousand cubic feet (Mcf) per day in 1971 and by 2004 had declined to 126 Mcf per day (EIA, 2005c).

By 2025, nationwide demand for natural gas is expected to increase by about 40 percent (API, 2005a). Prices are expected to continue to climb and stay volatile. Current data from DOE show that the average residential price of natural gas rose from $7.38 per thousand cubic feet (mcf) in January 2002 to $14.94/mcf in January 2006 (EIA, 2005c; EIA, 2007).

1.4.3 Load and Generating Capability

1.4.3.1 Growth in Generation to Serve Load Base

At present, SME owns no base load generation and meets its wholesale power requirements through the use of power purchase agreements with BPA and WAPA. As stated above, the BPA contract begins to expire in 2008 and by 2012 the cooperative member systems will face a supply deficit of approximately 160 MW, which includes the WAPA component. Table 1-2 is a summary of SME's cooperative member systems' projected capacity requirements for the period 2004-2018. Given the unfavorable conditions of the power purchase option this table may also represent SME's need for a generation resource suitable to meet this requirement. The following information is based on the assumption that SME will continue to have the opportunity to purchase approximately 20 MW from WAPA. If the power purchase rights in WAPA's power purchase agreement were reduced, the following projections would need to be increased accordingly. If the WAPA power purchase agreement were to be completely withdrawn, SME's cooperative member systems would have a projected requirement of approximately 160 MW in 2008, escalating to approximately 180 MW by 2012.

1.4.3.2 Combined Base Load Generation and Power Purchase Option

Over the course of the past 60 years the member systems of SME have met their total wholesale power supply requirements through the use of traditional power purchase agreements. Prior to June 22, 2000, the member system supply needs were met through a combination of purchases from the former Montana Power Company (MPC) and WAPA. The member systems had a defined allocation from WAPA that satisfied approximately 20 percent of the supply requirement, with MPC meeting the remaining need under the terms and conditions of an "all supplemental power requirements contract" that expired on June 22, 2000. Since the expiration of the MPC contract, the portion of the member system requirements previously supplied by MPC has been met with purchases from BPA. As explained earlier, the BPA purchase opportunity will begin to expire in 2008 and disappear completely in 2011 (SME, 2004a).

In the wake of the Energy Policy Act passed by Congress in 1992 and the Electric Utility Industry Restructuring and Customer Choice Act passed by the Montana Legislature in 1997, MPC embarked on a process to divest itself of its generation assets. MPC's generation assets were purchased by Pennsylvania Power and Light (PPL) in 1999, removing from the regulatory process wholesale power transactions involving energy produced by these assets. With the exception of wholesale power purchases made from non-Federal Energy Regulatory Commission (FERC) regulated federal power marketing agencies such as BPA and WAPA, all wholesale power transactions in Montana today are consummated at market rates. Montana ratepayers, at both the retail and wholesale level, no longer have access to electric energy at a regulated rate for service. Except for limited purchases from BPA and WAPA, electric energy prices in Montana are "market based."

Prior to broadening its list of options to include the concept of securing an equity position in a yet to be constructed generating facility, SME made several attempts to engage in meaningful discussions with owners of existing generation facilities to secure an affordable replacement for the expiring BPA contract. The most recent effort to secure a power purchase agreement was through a Request for Proposal (RFP) issued in November 2003. Clearly, the ideal situation would have been for SME to continue meeting approximately 80 percent of its needs with purchases from BPA, but that is no longer an option.

SME and its member systems have evaluated whether to embark on a plan to build their own generation resources. Included in those deliberations is the concept of continuing to meet a portion of its energy requirements with traditional power purchase agreements. As shown in Table 1-1 above, in 2009 SME's member cooperatives would meet approximately 20 percent of their wholesale power needs with continued use of SME's allocation from WAPA and purchases from regional suppliers of an Environmentally Preferred Product (EPP) that will include wind. Based on a review of existing alternatives, it would appear that SME's best option for the near term would be to meet its wholesale power requirements with a combination of purchases from WAPA, EPP, and its portion of the production from a new source of generation. Alternatives for post-2016 requirements would remain open, allowing for the timely evaluation of newly emerging resources that would complement SME's contemplated diverse supply portfolio.

The following calculations reflect the estimated cost of a new resource that would utilize "clean coal" technology and how the cost of that resource would be priced to the members of SME. The member system rates would fully cover the cost of developing that resource through member purchases, making allowances for "off peak" sales, and reflecting revenue from the interim sale of capacity secured for future SME loads. Options 1 and 2 reflect scenarios wherein SME would meet its needs above WAPA and EPP purchases with its own base load resource. Options 3 and 4 represent the increase in cost if SME were to purchase an additional 40 MW on the market at $45 per MWh.

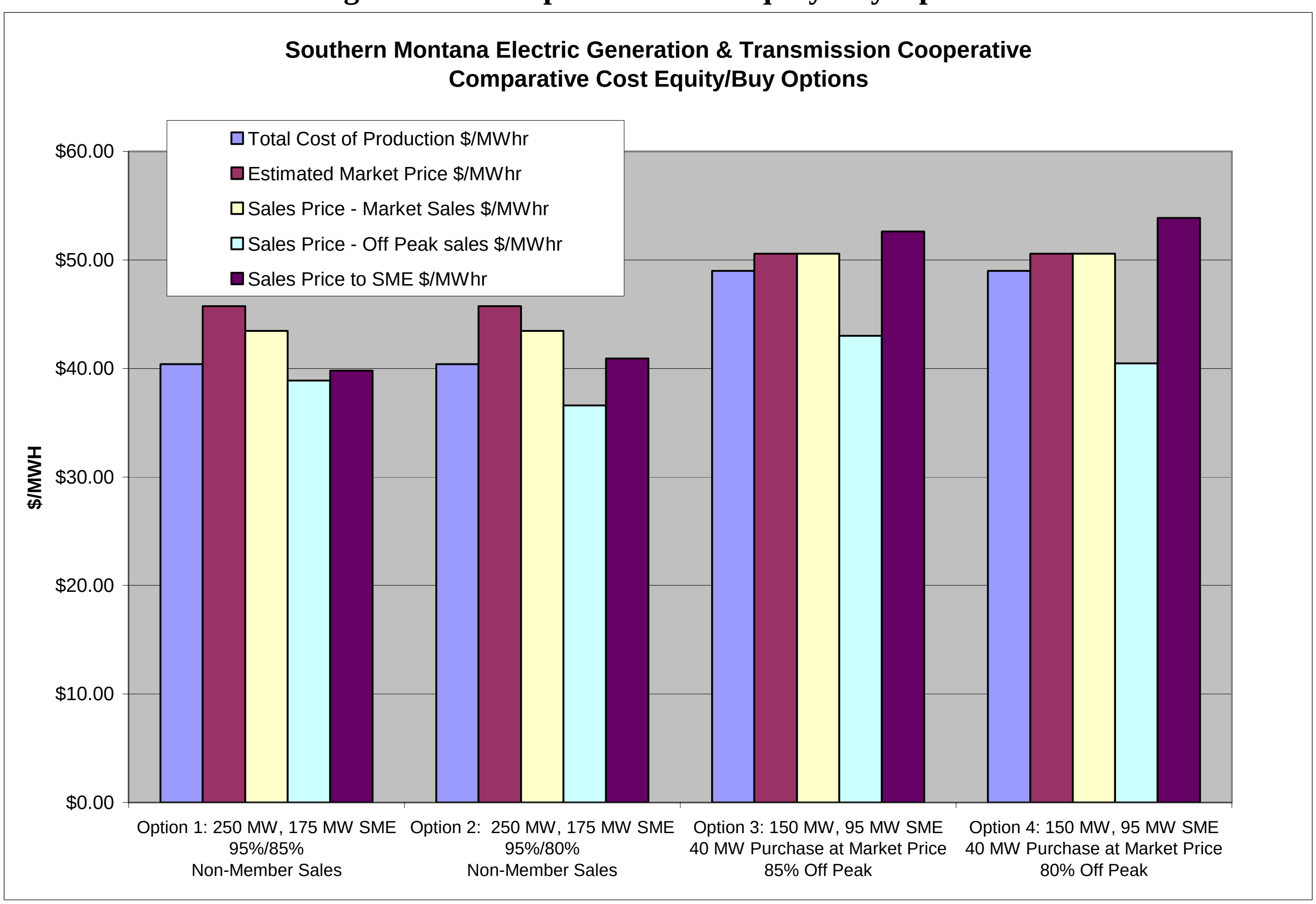
Table 1-2. SME Cooperative Member System Energy Requirements by Consumer Classification (MWH)

Southern Montana G&T	YEAR	RESIDEN-TIAL	SMALL COM-MERCIAL	LARGE COM-MERCIAL	IRRIGA-TION	OTHER SALES	TOTAL SALES	OWN USE & LOSSES	TOTAL ENERGY REQUIRE-MENTS
HI	1971	109,356	16,564	9,765	4,413	14,880	154,978	16,425	171,403
ST	1993	276,505	33,779	39,590	12,700	9,858	372,432	34,611	407,043
ORY	1998	287,688	36,349	39,471	20,577	9,957	394,042	38,435	432,477
	2003	329,497	51,270	31,077	19,944	10,001	441,789	44,737	486,526
	2004	338,229	52,105	31,600	19,294	10,042	451,268	47,749	499,018
P	2005	347,265	53,030	127,123	19,366	10,043	556,827	60,188	617,015
R	2006	356,669	53,882	133,180	19,426	10,043	573,201	61,988	635,190
O	2007	371,884	55,658	154,017	19,486	10,043	611,088	66,046	677,133
J	2008	387,576	57,475	174,864	19,548	10,043	649,508	70,149	719,657
E	2009	408,731	59,514	198,354	19,611	10,043	696,252	75,156	771,409
C	2010	421,723	60,506	198,605	19,674	10,043	710,551	76,613	787,164
T	2011	435,101	58,518	198,859	19,738	10,043	722,259	78,113	800,372
E	2012	448,876	62,550	199,117	19,804	10,043	740,389	79,653	820,042
D	2013	463,062	63,603	199,376	19,870	10,043	755,953	81,237	837,190
	2014	477,671	64,677	199,637	19,937	10,043	771,965	82,864	854,828
	2015	492,718	65,771	199,901	20,005	10,043	788,438	84,537	872,975
	2016	508,215	66,880	200,169	20,075	10,043	805,382	86,258	891,640
	2017	524,191	68,016	200,439	20,145	10,043	822,834	88,028	910,861
	2018	540,625	69,174	200,710	20,217	10,043	840,769	89,848	930,617
	YEAR	RESID.	SM COMM.	L. COMM.	IRRIG.	OTHER	T. SALES	USE & LOSS	T. REQ.
Growth Rate	1971-2003	3.72%	3.59%	3.68%	4.83%	-1.23%	3.33%	3.18%	3.31%
Historic	1993-2003	1.76%	2.10%	-1.20%	2.28%	0.07%	0.83%	1.51%	0.90%
	1998-2003	2.75%	7.12%	-4.67%	-0.62%	0.09%	2.31%	3.08%	2.38%
Growth Rate	2003-2008	3.30%	2.30%	41.27%	-0.40%	0.00%	8.01%	9.41%	8.14%
Projected	2003-2016	3.39%	2.06%	15.40%	0.05%	0.00%	4.72%	5.18%	4.77%
	2008-2013	3.62%	3.15%	2.66%	0.33%	0.00%	3.08%	2.98%	3.16%
	2013-2018	3.15%	1.69%	0.13%	0.35%	0.00%	2.15%	2.04%	2.14%
Historical									
% of Total	1971-2003	66.98%	9.21%	8.01%	3.85%	2.98%	91.04%	8.96%	100.00%
Projected									
% of Total	2004-2018	56.11%	7.84%	22.50%	2.55%	1.30%	90.29%	9.71%	100.00%

Figure 1-4 presents an analysis of the level at which the member purchases of wholesale power and related services would need to be priced in order to cover the embedded cost of developing a new generation facility. Option 1 describes a scenario in which SME would secure an equity position in a new 250-MW facility commensurate with 175 MW of the unit's total 250 MW. SME would utilize 135 MW of its entitlement to meet load, sell 40 MW of its capacity under the terms of a contract that would contemplate receiving 95 percent of a market price of $45 per MWh, and sell "off peak" energy at 85 percent of the market price of $45. In order to fully cover debt service, operation & maintenance (O&M), and related costs of ownership, under this scenario the cost for this portion of the members' requirement would need to be minimally priced at $39.79 per MWh.

Option 2 describes a scenario in which SME would secure an equity position in a new 250-MW facility commensurate with 175 MW of the unit's total 250 MW. SME would utilize 135 MW of its entitlement to meet load, sell 40 MW of its capacity under the terms of a contract that would contemplate receiving 95 percent of a market price of $45 per MWh, and sell "off-peak" energy at 80 percent of the market price of $45. In order to fully cover debt service, O&M, and related costs of ownership, under this scenario the cost for this portion of the members' requirement would need to be minimally priced at $40.92 per MWh.

Figure 1-4. Comparative Cost/Equity Buy Options



Option 3 analysis describes a scenario in which SME would secure an equity position in a new 150-MW facility commensurate with 95 MW of the unit's total 150 MW. SME would utilize 95 MW of its entitlement to meet load, purchase 40 MW of its capacity under the terms of a contract that would contemplate a market price of $45 per MWh, and sell "off peak" energy at 85 percent of the market price of $45. In order to fully cover debt service, O&M, related costs of ownership and the difference in cost for the energy purchase under this scenario the cost for this portion of the members' requirement would need to be minimally priced at $52.62 per MWh.

Option 4 describes a scenario in which SME would secure an equity position in a new 150-MW facility commensurate with 95 MW of the unit's total 150 MW. SME would utilize 95 MW of its entitlement to meet load, purchase 40 MW of its capacity under the terms of a contract that would contemplate a market price of $45 per MWh, and sell "off peak" energy at 80 percent of the market price of $45. In order to fully cover debt service, O&M, related costs of ownership and the difference in cost for the energy purchase under this scenario the cost for this portion of the members' requirement would need to be minimally priced at $53.87 per MWh.

The foregoing economic analysis demonstrates that SME's best option is to build generation capacity capable of meeting peak member system requirements, as expressed in either Option 1 or Option 2.

1.4.4 SUMMARY AND CONCLUSION

Based on SME's existing and projected capacity and energy requirements, in 2009 it will have a resource requirement or deficit of approximately 116 MW. By 2012 this deficit will grow to approximately 160 MW as the BPA power purchase agreement is phased out. Given the price volatility of natural gas and the lack of viable wholesale power purchase options, SME believes it needs to develop an alternate wholesale power supply resource. This alternate wholesale power supply resource could take the form of participating in the development of a variety of generation options to complement its ability to make limited purchases from WAPA and purveyors of an EPP like wind-generated power.

Acknowledging the difference between base load production and peak requirements, SME has concluded it would best serve the interest of its members by integrating base load capacity into its resource portfolio. Given the volatility of the regional supply market and the high cost of resorting to the open market to meet peak requirements, the likelihood of being able to offer affordable, reliable, and stable wholesale electric energy and related services is much greater if SME owns generation capacity capable of covering system peak requirements as specified in the load forecast. SME believes that the forecasted prices for market power justify resource ownership that will, at a minimum, cover member system peak requirements (PowerLytix, 2006).

Several important issues must be addressed in detail to gain a clear understanding of the total cost of resource development. Those issues include, but are not limited to, debt service, cost of operation and maintenance including fuel, operating reserves, spinning reserves, load control area services and facility dispatch. SME must ensure service in the event the proposed project ceases production on a scheduled or unscheduled basis. To that end, SME has engaged in

discussions with large regional hydroelectric-based generators which have expressed significant interest in working with SME to ensure that the total output of a contemplated facility would be economically dispatched, with the participating generators sharing risk and benefits. The estimated costs in the models shown in Figure 1-4 reflect the cost of this service.

The member systems of SME have had a long history of meeting the wholesale electric service requirements of the consumers they serve with affordable electric energy and related services. However, the wholesale supply industry in this region and the country has changed, requiring the members of SME to view possible participation in this proposed project as a way for SME to serve its members with a much higher level of confidence than can be afforded by a traditional power purchase agreement – particularly in a restructured wholesale electric supply market place.

In demonstrating to RD how to best meet its power supply obligations in the face of a looming phase-out of its main existing power source, SME concluded that owning its own source of electric generation would be in the best interest of its member systems. SME proposes to construct a 250 MW coal-fired power plant near Great Falls, Montana. The Proposed Action also includes four 1.5 MW wind turbines, construction of approximately 14 miles (23 km) of transmission lines, substation facilities, raw water, potable water and wastewater pipelines, and about six miles of railroad tracks for delivery of coal to the plant, in addition to other components.

In addition to the intention to provide a reliable supply of electricity at an affordable price, the Proposed Action would furnish local employment in the Great Falls area during construction and operation. It would also provide tax benefits for Cascade County and the City of Great Falls, as well as other associated socioeconomic benefits, which are discussed in the socioeconomics section of Chapter 4.

1.5 PUBLIC PARTICIPATION

1.5.1 SCOPING PROCESS

NEPA and MEPA require agencies to invite public involvement prior to decision-making on proposed actions that may affect the environment. “Scoping” is the process of soliciting input from “stakeholders” – including Tribes, the public (both private citizens and non-governmental organizations or NGO’s), and other agencies – at the outset of a NEPA/MEPA analysis. Not only may the information obtained from interested and knowledgeable parties be of value in and of itself, but the perspectives and opinions as to which issues matter the most, and how, indeed whether, the agency should proceed with a given proposed action are equally important. Input from scoping thus helps shape the direction that analysis takes helping analysts decide which issues merit consideration. Public input also helps in the development of alternatives to the proposed action, which is an integral part of NEPA and MEPA.

1.5.1.1 RD Scoping

Figure 1-5. Open House Scoping Meeting in Great Falls Civic Center on October 13, 2004

RD and DEQ conducted two separate scoping processes to solicit public input on SME's proposed power plant. Scoping by RD came first, and was carried out in the fall of 2004. RD published a Notice of Intent (NOI) to hold a public scoping meeting and prepare an EIS in the *Federal Register* on September 24, 2004. A public scoping meeting was held on October 13, 2004 at the City Civic Center in Great Falls, Montana. The public was notified of the meeting by advertisements in the local newspapers, including the *Billings Gazette* and the *Great Falls Tribune*. The scoping meeting was arranged in an open house format, featuring a series of information stations. Each station was staffed by SME representatives or their consultants; RD, DEQ, and DNRC representatives were also present. Fact sheets and other informational handouts were available, as was a comment form for attendees to complete. Based on sign-in sheets, a minimum of 74 people attended the public scoping meeting.

A total of 13 written responses containing 40 comments were received during the RD scoping comment period that ended November 15, 2004. Public comments were received in the form of direct letters mailed to SME and RD, emails, verbal comments, and completed comment forms. All written comments were entered into a spreadsheet for analysis and summary.

In addition to the public meeting, two agency scoping meetings were held, the first at DEQ offices in Helena on the afternoon of August 12, 2004, and the second at the Civic Center in Great Falls on the morning of October 12, 2004, with a site visit afterwards. Also, on October 5, 2004, RD sent a letter containing a brief project description to various federal and state agencies, followed on October 22, 2004 by copies of the Alternative Evaluation Study and Site Screening Study provided by Stanley Consultants. Agencies that responded included the federal Natural Resources Conservation Service (NRCS), U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Federal Aviation Administration, Montana Department of Transportation, Montana Historical Society (Montana's SHPO), and the Lewistown Water Resources Office.

SME also held 20 or more meetings with the Great Falls City Commission, school districts, environmental groups, and individual cooperative memberships. The proposed power plant was discussed in 27 articles in local newspapers. These meetings and this media coverage occurred before, during and after the formal public scoping period.

RD issued a scoping report that summarizes the process as well as input received from the public. This summary is available at the RD website at: http://www.usda.gov/RD/water/ees/pdf/sme_RDscopingcomments.pdf .

1.5.1.2 DEQ Scoping

Supplemental to the scoping carried out by RD in the fall of 2004, DEQ conducted additional scoping in the spring of 2005 to comply with Montana procedures. The DEQ public scoping meeting was held on April 18, 2005 at the Great Falls Civic Center and the 30-day public scoping period lasted from April 6 to May 6, 2005. The public was notified of the scoping meeting and comment period by advertisements in the local newspapers, via State websites and through specific invitations. There were 45 people registered on the attendees' list at the April 18 meeting; others were present who did not sign the attendance list.

A total of 38 written responses containing 137 comments were received from the public and agencies during the scoping comment period. Comments were received in the form of direct letters mailed to DEQ, emails, and completed comment forms. All written comments were entered into a spreadsheet for analysis and summary.

DEQ also issued a report summarizing its scoping process as well as input received from the public and agencies. This summary is available at the DEQ website at: http://deq.mt.gov/eis/SME_Scoping/MDEQScopingRprtFinal.pdf .

Subsequent to both the RUS and DEQ scopings, SME has continued to meet with the Great Falls City Commission and other groups. There have also been numerous articles in local newspapers.

1.5.2 DEIS Public Review and Comment

The original 45-day DEIS comment period began on June 29, 2006 and was to close on August 15. However, upon request, the agencies agreed to extend the comment period by two weeks to August 30, 2006. An open house and public hearing was held in Great Falls on June 27, 2006. Again upon request, an additional hearing was held in Havre on August 7. Approximately 150 people attended the Great Falls open house and hearing and approximately 70 individuals presented testimony at the hearing. Approximately 70 people attended the Havre open house and pubic hearing, while about 40 people presented testimony.

Public comment on the DEIS took several forms: oral testimony at the public hearings, written comment in the form of emails, letters, postcards and a petition. Counting all of these forms, more than 5,000 people commented on the DEIS, though most of these consisted of signatures on postcards and petitions. More than 200 comment letters were received by RUS and DEQ. Appendix L of the FEIS contains a summary of comments and the agencies' responses.

The main changes resulting from public comments are summarized in the bullet points under each chapter below.

Chapter 2.

- *Additional information has been included on Integrated Gasification Combined Cycle (IGCC) technology.*

- *Nuclear fission has been added to the list of non-renewable alternatives considered but eliminated.*

- *Two combinations of energy sources have been added to the list of alternatives considered but eliminated.*

- *The explanation of the methodologies used in the site screening and site selection studies is further elaborated.*

- *A new section (2.1.7.4) is added which describes four additional sites in the Great Falls area that were considered and rejected during the site selection process.*

- *The description of the Proposed Action (Highwood Generating Station at the Salem site) is modified to reflect a shift in the location of the HGS in response to concerns about its potential impact on the Great Falls Portage National Historic Landmark.*

- *Certain conclusions in the impacts comparison matrix (Table 2-14) have been modified to reflect changes in the way certain impacts are characterized.*

Chapter 3.

- *Numerous minor text edits have been made.*

- *A number of maps have been modified to reflect the shift in the location of the HGS at the Salem site.*

Chapter 4.

- *Numerous minor text edits have been made.*

- *A number of maps have been modified to reflect the shift in the location of the HGS at the Salem site.*

- *Various impact ratings have been reconsidered and modified as to level of significance, in particular under the topics of Noise and Transportation, where certain impacts have now been rated as significant.*

Chapter 5.

- *Several minor text edits have been made.*

1.5.3 FORTHCOMING OPPORTUNITIES FOR PUBLIC PARTICIPATION

Upon release of the FEIS to the public for review and comment, RD will publish a notice in the *Federal Register*, and DEQ will send news releases to print and broadcast media in Great Falls, Havre, and Billings, Montana and the State website informing the public of its availability. In addition, notices will be sent via U.S. mail to individuals, NGOs and agencies which previously expressed interest in continuing to participate in public review of the proposed power plant.

The day the U.S. Environmental Protection Agency (EPA) publishes a Notice of Availability in the *Federal Register* marks the beginning of a 30-day federal comment period on the FEIS. Written comments may be submitted to RD. While agencies are not required to request comments on FEISs [40 CFR 1503.1(b)], RD will solicit comments on the FEIS, but does not intend to formally respond to these comments. However, a summary of the comments received, and any responses if warranted, will be included in the Record of Decision. DEQ does not have a comment period on FEISs.

The agencies will issue their records of decisions (RODs) either jointly or separately after RD's public comment period on the FEIS. RD will issue its decision regarding funding for 75 percent of the cost of the power plant. DEQ will issue decisions regarding SME's air quality and solid waste permit applications. The public will have the right to appeal DEQ's permit decisions to the Board of Environmental Review. Any challenges regarding the adequacy of the FEIS under NEPA or MEPA would have to be made through the federal or state court systems, respectively.

1.6 ISSUES DEVELOPMENT

1.6.1 KEY ISSUES

Significant or key issues are intended to form the basis of the NEPA/MEPA analysis. In other words, they define the scope of the analysis. Once the scope has been defined, the project benefits, purpose, and need and key issues govern the range of reasonable alternatives that will be considered in the environmental analysis. Alternatives must at least partially meet the project benefits, purpose, and need and address one or more of the key or significant issues. This section presents the key issues identified during scoping. These issues defined the scope of the NEPA/MEPA analysis and the alternatives considered. The italicized text indicates how RD and DEQ evaluated and estimated effects relative to those issues.

Issue 1: Soils and Topography

Construction would involve excavation and disturbance of soils as well as certain permanent changes to topography on whatever site is selected to build the power plant. In addition, waste management could potentially impact soils. *Effects are predicted by evaluating the extent to which the proposed action and connected actions may contribute to soil erosion and contamination.*

Issue 2: Water Resources

The proposed action would both use raw water and discharge waste water. In addition, during construction there would be potential for erosion, turbidity and sedimentation from runoff during storm events. In addition, comments from the public on water issues were received during scoping. Some of these comments expressed concern regarding pollution of water resources resulting from power plant emissions or discharges, while others related to water rights and usage, specifically the use of Great Falls water rights for the project and the usage of water in a drought condition. *Effects on water quality in the Missouri River are predicted by comparing the existing water quality conditions with characteristics of the projected discharge. Effects on water quantity/resources in the Missouri River are predicted by comparing projected withdrawals with flows in the river.* [Note that, as currently planned, the Proposed Action would not discharge waste water directly to the Missouri River, but into the City of Great Falls' waste water treatment system.]

Issue 3: Air Quality

Even though it would utilize the latest Best Available Control Technology (BACT) and be considered a state-of-the art, "clean coal" facility, and be permitted by the State of Montana, the proposed plant would emit a variety of pollutants to the air, as do all fossil fuel thermal electric generating stations. During scoping, numerous commenters expressed concerns about the potential impacts of emissions from the coal-fired plant, including mercury. *Effects on air quality are predicted using the most recent technical models such as CALPUFF developed and applied by specialists in the field and by a review of the published scientific literature on mercury emissions, transport, deposition, uptake, and toxicity.*

Issue 4: Biological Resources

During scoping, the U.S. Fish and Wildlife Service identified two federally-listed species that may potentially occur in the project area – the threatened bald eagle and the threatened Canada lynx. The Service requested RD to determine possible impacts to species of federal concern. In addition, species of concern within the State of Montana could potentially be present on the project site. *Effects on biological resources, including federal and state-listed species, are predicted, first, by conducting field surveys of the subject locations, including right-of-way corridors for pipelines or transmission lines to inventory which habitats occur and which species may potentially occur; and second, by considering the various elements of the proposed action which may lead to changes in habitat (including direct conversion and fragmentation), and thus, changes in wildlife populations, or that may directly induce mortality.*

Issue 5: Noise

Construction and operation of a coal-burning power plant near Great Falls could add to noise levels in the area from construction equipment, truck traffic, trains, the vehicles of commuting workers, and operation of the various components of the industrial facility. One commenter during scoping expressed concern about noise generation by the proposal. *Effects on the acoustic environment are predicted by a two-step process: 1) characterizing existing ambient*

noise levels (i.e. a noise profile) and 2) introducing known noise levels of equipment likely to be used in construction and operation. Using the Cadna-A Version 3.5 noise prediction software from DataKustik, noise level contours for the combined typical power plant equipment and train operations have been developed.

Issue 6: Recreation

Construction and operation of a major new industrial facility in the Great Falls area could hypothetically generate direct and/or indirect impacts on recreational facilities and opportunities in the area, in particular those related to the Missouri River and the Great Falls Portage National Historic Landmark. While no comments were received during scoping expressing concern about potential impacts specifically on outdoor recreation, concern was expressed about related issues, such as air, water, visual impacts, and wildlife. *Effects on recreation are predicted by characterizing existing facilities and opportunities in relation to proposed project sites, characterizing the key elements and processes of the proposed action that might affect recreation, and estimating qualitatively the extent to which these elements or processes may enhance or detract from the recreational experience.*

Issue 7: Cultural Resources

The Great Falls area contains important historic/cultural resources, such as the Great Falls Portage National Historic Landmark commemorating the Corps of Discovery (Lewis and Clark Expedition). Construction of a power plant could conceivably impact cultural resources in a variety of ways. During scoping, the Montana State Historical Society (which is the State Historic Preservation Office or SHPO in Montana) stated that the project may have the potential to impact cultural properties and recommended that a cultural resources inventory be conducted. *Effects on cultural resources are predicted by conducting an inventory of cultural resources, including traditional cultural properties, using established methodologies, and evaluating the likely impact of specific components of the proposed action and alternatives on these resources.*

Issue 8: Visual Resources

Construction of a large power plant and related facilities such as transmission lines in an undeveloped area could potentially affect scenic quality and visual resources. Several comments expressing concern about possible visual impacts were received by members of the public during scoping. *Effects on visual resources and scenery are predicted by using a methodology developed by the Bureau of Land Management (BLM) called the Visual Resource Management (VRM). VRM consists first of a visual resource inventory to determine the quality of existing scenic values at affected sites followed by an analysis using a visual contrast rating process, which involves comparing the project features with the major features in the existing landscape using the basic design elements of form, line, color, and texture. (Visual impacts on federal mandatory Class I areas are addressed under Air Quality.)*

Issue 9: Transportation

Both construction and operational phases of the proposed action could potentially affect transportation in the Great Falls area – including road, rail, and air transport. One commenter raised the issue of traffic impacts during public scoping. Also during scoping, the Federal Aviation Administration (FAA) advised RD that a form (7460) would need to be completed for the proposed power plant that would enable FAA to prepare a study of possible impacts on air traffic at Great Falls International Airport. *Effects on transportation are predicted by first establishing the proximity of transportation infrastructure and current use patterns, particularly Average Daily Traffic (ADT) (if available) on nearby roads and streets, and then estimating traffic generated by phases of the proposed action using procedures developed by the Transportation Research Board.*

Issue 10: Farmland and Land Use

Construction of a power plant on an undeveloped site in the Great Falls area could entail the permanent conversion of farmland to industrial land use. During scoping, the Natural Resources Conservation Service (NRCS) requested RD to document any such loss of farmland according to the procedures of the Federal Farmland Protection Act, which applies to actions of all federal agencies that may directly or indirectly lead to the irreversible conversion of agricultural lands to non-agricultural land uses. There was some public concern about farmland conversion as well. *Effects on farmland and land use are predicted by documenting the type and quality of farmland present on proposed building sites and evaluating any loss of farmland according to federal and state criteria.*

Issue 11: Waste Management

Operation of a power plant would generate considerable quantities of solid waste, particularly ash, which is a residual of coal combustion. Disposal of ash was the subject of some public concern during scoping. *Effects from waste management are predicted by characterizing both the quantity and quality of the waste stream and examining how proposed waste management practices will dispose of wastes.*

Issue 12: Human Health and Safety

Construction and operation of any large industrial facility involves certain risks to human health and safety. A coal-fired power plant in particular raises questions about possible effects on human health and safety from air emissions. During scoping, members of the public expressed concern about air pollution-related diseases such as cancer, asthma, and autism (the latter from mercury emissions in particular). *Effects on human health and safety are predicted by examining whether or not the proposed facility would comply with the National and Montana Ambient Air Quality Standards (for "criteria" pollutants) as well as with BACT requirements, and in the case of mercury, by reviewing what science knows and does not know about mercury emissions, deposition, biological uptake, bioaccumulation/biomagnification, and toxicity, and by reviewing applicable federal and state standards for emissions from power plants.*

Issue 13: Socioeconomics

Construction and operation of the proposed power plant would entail impacts on employment, income, taxes, property values, and population in the Great Falls area. Several people commented on these possible effects during public scoping. *Effects on socioeconomics are predicted by characterizing the existing socioeconomic environment of the Great Falls/Cascade County area, quantifying projected direct employment associated with construction and operation of the power plant, and using an employment multiplier for Cascade County from the Montana Governor's Office of Economic Opportunity to estimate direct and induced employment.*

Issue 14: Environmental Justice/Protection of Children

Two Executive Orders issued by the president of the United States require all federal agencies to examine possible disproportionate impacts of the proposed action on minority and low-income populations and children. *Effects on environmental justice and protection of children are predicted by establishing the proportion of minorities and low-income populations in the affected area and determining whether some facet of the proposed action would lead to disproportionate, adverse impacts on them.*

1.6.2 Issues Considered But Dismissed

RD and DEQ reviewed the issues raised during scoping and concluded that some issues raised by the public were outside the scope of this EIS, were items that are addressed by law or regulation, were items that are unrealistic or unreasonable to implement, or were insignificant issues that are covered by larger and significant issues. The rationale for eliminating these issues is provided in the descriptions below.

- Wetlands – Wetlands are not dismissed entirely from the EIS but are not considered a key issue because of their virtual absence from the proposed project sites. Where pipeline or power line corridors cross wetlands or other "waters of the United States" under the jurisdiction of the U.S. Army Corps of Engineers and protected by Section 404 of the Clean Water Act, no permanent fill would be placed into these waters and at most there may be temporary disturbance at stream crossings.

- Burning fuels other than coal in the proposed power plant – Based on recent experience with at least one other Montana generating station, some concern was expressed that SME's power plant, once operational, may attempt to burn fuels other than coal. However, the Air Quality Permit issued by DEQ is based on coal combustion in the Circulating Fluidized Bed (CFB) boiler to produce steam and generate electricity, except when fuel oil is used during start-up and shutdown of the CFB boiler.

- Reclamation/Remediation – The EIS does not discuss potential future reclamation or remediation for the plant site were it to be decommissioned or shut down at some point in the future. Given the projected 30-50 year life of a coal-fired generating station, decommissioning and cleanup were deemed beyond the time frame of the EIS.

Furthermore, the plant and surrounding property on which ash may be disposed would be managed in such a way that when the facility closes, it would not leave behind contamination and pollution problems. However, closure of the solid waste cells in which the fly ash would be stored is addressed in the solid waste license. Coal-fired power plants are not like nuclear power plants, for which decommissioning and removal of materials and components contaminated by radioactivity are major issues.

- State solid waste exclusion for on-site disposal of ash – The EIS does not consider possible changes to law.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

In response to public comments, RD and DEQ have made a number of changes to Chapter 2. These changes are summarized in the italicized bullets below. Any additions or changed text in the FEIS from the DEIS as a result of public comments are shown in double underlining. Deletions are not shown. The main changes in Chapter 2 are:

- *Section 2.1.5.4 on Integrated Gasification Combined Cycle (IGCC) technology has been expanded with new information.*
- *Nuclear fission has been added to the list of non-renewable alternatives considered but eliminated (Section 2.1.5.6).*
- *Two combinations of energy sources have been added to the list of alternatives considered but eliminated (Section 2.1.6). These include one combination alternative consisting of a smaller CFB plant and energy efficiency/conservation with renewable energy sources (Section 2.1.6.1) and another combination alternative consisting entirely of energy efficiency/conservation and renewable energy sources (Section 2.1.6.2).*
- *The explanation of the methodologies used in the site screening and site selection studies is further elaborated in Section 2.1.7.*
- *A new section (2.1.7.4) is added which describes four additional sites in the Great Falls area that were considered and rejected during the site selection process. These include the Sun River site, Manchester area, a site north of Malmstrom Air Force Base, and the Section 36 site. A rationale is included for why each of these sites was deemed inadequate.*
- *The description of the Proposed Action (Highwood Generating Station at the Salem site) is modified to reflect a shift in the location of the HGS in response to concerns about its potential impact on the Great Falls Portage National Historic Landmark. The original proposed location of the HGS would have been within the NHL; the new location is just outside the NHL.*
- *Certain conclusions in the impacts comparison matrix (Table 2-14) have been modified to reflect changes in the way certain impacts are characterized.*
- *Several new figures have been added, captions of several existing figures have been changed, and throughout the chapter, text edits and corrections have been made in response to comments.*

To determine how best to procure needed power and meet obligations to its member utilities in the face of a looming phase-out of its main existing source – and following the guidance set forth by RD to prospective loan recipients – SME conducted an alternatives analysis and an electric load analysis. Based on these analyses, SME concluded that owning its own source of electric generation is in the best interests of its members. SME then conducted a site selection analysis for a proposed facility. This analysis consisted of a broad-scale, site-screening study initiated early in 2004 (SME, 2004d). This study was a state-wide constraints and opportunities analysis, from which emerged four potential power plant areas. Next, SME conducted a more detailed site-selection study, which further analyzed the areas by identifying and comparing specific sites at the four general areas. SME also conducted an evaluation of sites in the Great Falls area as described in this chapter. As a result of these analyses, SME proposes to construct a 250 net MW coal-fired power plant at a site near Great Falls, Montana. This proposed action would also include construction of approximately 13 miles (21 km) of 230-kV transmission lines and about six miles (10 km) of railroad tracks for delivery of coal and limestone to the plant, in addition to several other connected actions, among them the construction and operation of four 1.5-MW wind turbines.

SME evaluated alternatives to the proposed power plant in terms of cost-effectiveness, technical feasibility, and environmental soundness. RD and DEQ reviewed SME's evaluations of these alternatives in this EIS. RD and DEQ added the oil and nuclear generation alternatives to the original list, as well as the combination alternatives. The alternatives considered were:

1. Power Purchase Agreements – Power purchases from existing regional suppliers of wholesale electric energy and related services.

2. Energy conservation and efficiency – Demand side management and the ability of increased energy efficiency to offset the projected increases in energy demand.

3. Noncombustible renewable energy sources – Renewable energy technologies considered included wind, photo voltaic (solar), hydroelectric and geothermal.

4. Combustible renewable energy sources – Renewable combustible technologies considered included biomass, biogas, landfill gas, and municipal solid waste.

5. Nonrenewable combustible and nuclear energy sources – Traditional combustible and nuclear technologies considered included:
    - oil
    - nuclear
    - natural gas-fired boilers and combustion turbines - both simple and combined cycle configurations
    - other carbon-based fuel burning technologies including fluid-bed combustion and integrated gasification combined cycle (IGCC) technology.

6. Combinations of energy sources:
    - A reduced 150-MW CFB coal-fired power plant in conjunction with a combination of conservation, efficiency improvements, and renewable energy sources

- A combination of lower-emission, non-renewable fuels like natural gas with a combination of conservation, efficiency improvements, and renewable energy sources

RD and DEQ considered these and other alternatives in this EIS and evaluated them according to the purpose and need and issues identified in Chapter 1. Reasonable alternatives are fully evaluated and presented in comparative form along with the proposed action. Other alternatives were identified during scoping but were eliminated from detailed study in the EIS. The reasons for not fully evaluating these alternatives are explained in this Chapter.

This chapter describes alternative approaches to meeting the benefits, purpose and need and addressing the issues discussed in Chapter 1. The purpose of the proposal is to meet a forecasted deficit in SME's wholesale power supply. For the alternatives described in the following sections to be considered reasonable for further consideration, they must fully meet the projected electric power needs for the SME service area.

Alternatives were evaluated in terms of their cost-effectiveness, technical feasibility, and environmental issues (consequences and constraints). The cost-effectiveness of each alternative was addressed by evaluating the initial capital costs as well as the long-term cost of operation and maintenance, including the cost of fuel over the projected life of the project. The technical feasibility of each generation option was evaluated on the basis of the alternative's ability to provide a highly reliable source of generation compatible with the energy needs as defined above. To be reasonable, an alternative must also be commercially available and capable of providing 250 MW of base load capacity by 2012 for the SME service area.

Section 2.1 describes alternatives that were considered but were eliminated from detailed evaluation in the EIS because they did not satisfy the criteria of cost-effectiveness, technical feasibility, or environmental acceptability.

Section 2.2 describes the three alternatives evaluated in detail in the EIS.

2.1 ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

This section includes alternatives that were investigated, but found to not fully meet the stated requirements for detailed analysis. The rationale for their elimination is also provided.

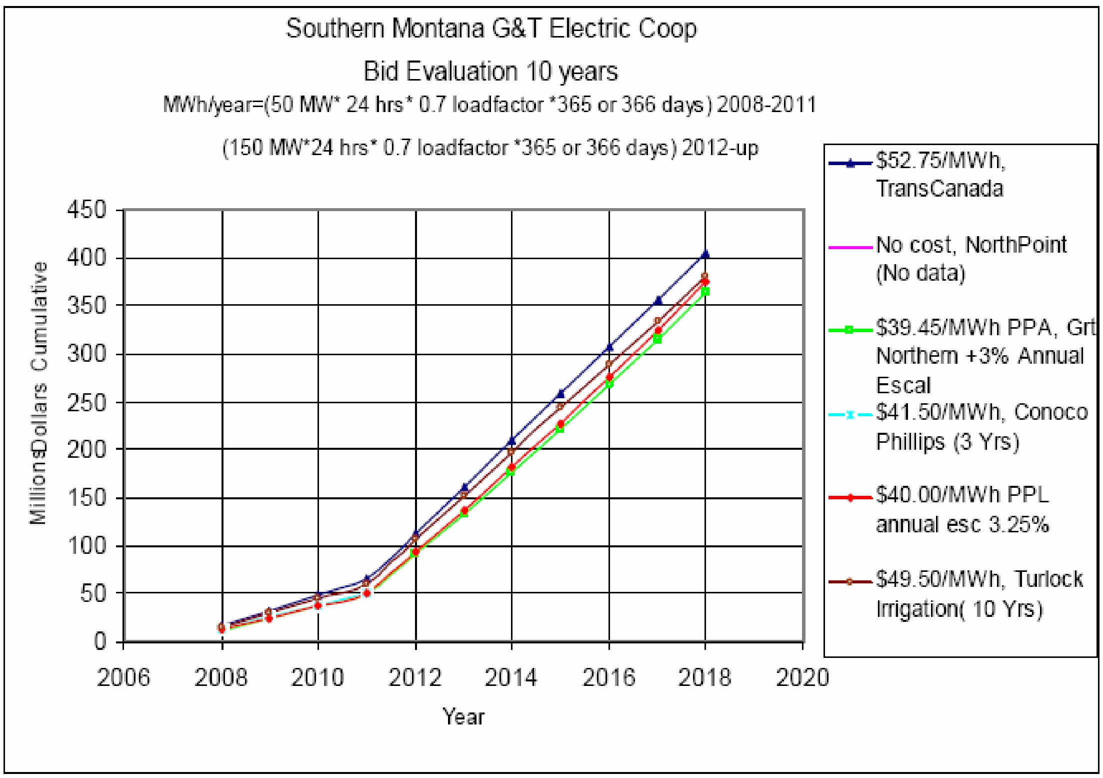
2.1.1 POWER PURCHASE AGREEMENTS

In order for a power purchase proposal to receive serious consideration, a suitable transmission path must be available from the generation source to the load control area in which SME's member systems are located. There are a number of transmission constraint points in Montana through which additional firm deliveries are not possible without considerable investments in transmission infrastructure. Non-firm transmission paths are not a viable option.

As explained in Chapter 1, the member cooperatives of SME currently meet their wholesale electric energy and related services obligations through the use of power purchase agreements with BPA and WAPA. In 2011, when the inherent power purchase rights in the BPA contract fully expire, the member cooperatives of SME will have a projected load of approximately 180 MW. At that time the member cooperatives of SME will have residual power purchase rights with WAPA of approximately 20 MW. If the WAPA power purchase agreement were to be completely withdrawn, the member cooperatives of SME would have a projected requirement of approximately 160 MW in 2008, escalating to approximately 180 MW by 2012 (SME, 2004a). (As noted in Chapter 1, Electric City Power of Great Falls, MT will have a load requirement of approximately 65 MW when its purchase contract with PPL expires in 2011.)

With RD's oversight and guidance, SME conducted an extensive search in the regional wholesale power supply marketplace for a suitable source of energy to meet its member system requirements with a power purchase agreement secured from an existing source of generation within the Western System Coordination Council (WSCC), of which SME is a member. Figure 2-1 shows the results of SME's November 2003 Request for Proposal (RFP) on the basis of the cumulative cost of the proposal for a 10-year period from 2009-2018.

Figure 2-1. Summary of the Results of SME's November 2003 RFP 10-year Evaluation



In January 2006, the weighted price of wholesale electricity through the Western Electricity Coordinating Council (WECC, successor to the WSCC) fluctuated between approximately $60 and $62 per MWh, or $15 per MWh – about 30 percent – more than the approximately $44-47 per MWh SME expects to pay to produce its own power (PowerLytix, 2006).

In early December 2006, SME engaged in discussions with a regional provider of wholesale electric energy and related services for the purpose of securing varying blocks of power to meet the needs of additional retail customers seeking service from the City of Great Falls; and a portion of the post July 2008 supply needs of the Cooperative member systems. SME has a number of contracts with this entity that has traditionally responded to similar RFPs with a price that is below market and far less than other respondents.

The results of this RFP indicate that the price regional suppliers are requesting for a long-term "firm" supply reflects the upward trend in natural gas prices and a decreasing supply of "firm" generation capacity not already subject to long-term contract. The indicative prices contained in the proposal were in excess of $56 per MWh less the cost of transmission. When adjusted to reflect the cost of transmission the price would be approximately $64 per MWh if the energy were delivered to NWE's transmission system, and approximately $66 per MWh if delivered to the Mid Columbia/BPA transmission system. This price would be for modestly shaped blocks of power for the periods February 2007 through August 2011, and July 2008 through August 2011.

A review of the published price NWE intends to pay to meet its default supply obligation post-2007, and the forecasted price for "market purchases" at the Mid Columbia, is consistent with the aforementioned offer. These prices represent an approximate 20 percent increase in the price of wholesale power proposals since SME entered into a several power purchase contracts in June 2006.

The lack of affordable generation capacity in the WECC, combined with ever-increasing transmission constraints, limits the future viability of purchasing capacity from existing sources of wholesale supply. As discussed in Chapter 1, the WECC has relied almost exclusively on natural gas fired generation to meet future regional supply requirements. With the cost of natural gas fired generation constituting the future marginal cost for wholesale electric energy and related supply services, the price SME would pay for power supply could be nearly double its current costs for this service commodity because of the price volatility of natural gas. Based on a search in the power supply marketplace for a suitable supply of energy, and analysis of related transmission issues, SME concluded that negotiating an acceptable power purchase agreement to meet future energy needs does not appear to be a viable option (SME, 2004a). RD concurs with this assessment.

2.1.2 Energy Conservation and Efficiency

Energy efficiency means doing the same work with less energy. Energy efficiency improvements can free up existing energy supply. Energy efficiency incentive programs have been found to be cost-effective in terms of reducing load growth. Energy efficiency in buildings means using less energy for heating, cooling, and lighting. It also means buying energy-saving appliances and equipment for use in a building. Promotion and use of energy efficiency programs generally have neutral or beneficial effects on the environment by slowing down or eliminating the need for additional power sources.

Around the country, a number of electrical utilities sponsor programs that encourage customers to invest in energy efficiency products and energy-efficient appliances that lower consumer

energy bills, delay the need for new electrical generation capacity, and reduce the emission of greenhouse gases and other pollutants. Technologies that maximize the efficient generation, transmission, and storage of energy are central to such programs (DOE, 2005a). Demand Side Management (DSM) is one example of a promising form of energy efficiency promotion; it refers to utility-facilitated actions undertaken by customers to reduce the amount or alter the timing of energy consumption (DOE, 2005b). Utility DSM programs furnish an array of measures that can lower both energy consumption and consumer energy expenses. Electricity DSM strategies aim to maximize end-use efficiency to avoid or postpone the construction of new generating plants. Means of accomplishing this include load reduction, load leveling, energy storage devices, and rate schedule/structuring such as time-of-use rates that charge consumers higher prices for peak electricity and lower prices for off-peak electricity (DOE, 2005b).

In 1997, the Montana Legislature passed Senate Bill 390, which required electric utilities and cooperatives in the state to invest a minimum of 2.4 percent of their annual retail sales in a universal systems benefits program focused on the acquisition and support of renewable energy and conservation related activities (69-8-402, *et seq.*, MCA). According to SME, since 1997, SME's member cooperatives have complied with this state mandate to invest a portion of their total revenues in a conservation program. Conservation measures include rebates on ground source heat pumps and the installation of energy efficient appliances and retrofit lighting. The installation of equipment is almost universally replacement in kind or is located on the end user's property, thus resulting in little to no additional land use (footprint) issues. Permits that may be required are typically obtained at the local agency level through the residential or commercial / industrial building permit process. Table 2-1 documents SME expenditures in 2004 on conservation.

Energy conservation is a key component of a program managed by DEQ called Energize Montana (DEQ, 2005b). Figure 2-2 is a graphic from the Energize Montana website. The website provides information for citizens, schools, businesses and government on a variety of energy-related topics, including energy conservation and efficiency. DEQ publishes the *Montana Energy Savers Guidebook* and has staffed programs in the areas of Energy Planning & Technical Assistance, Public Buildings & Renewable Energy, and Business & Community Assistance.

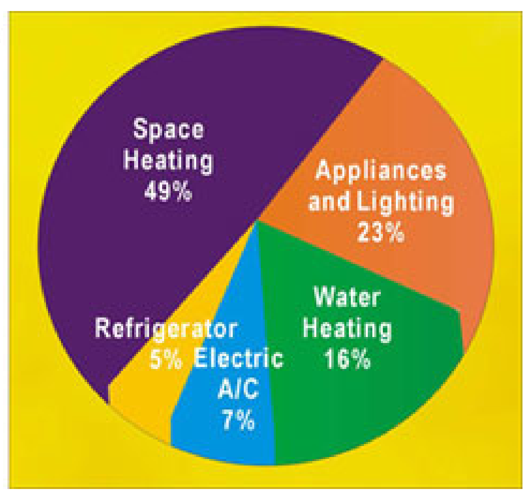


Figure 2-2. "How We Use Energy in Our Homes" – Educational Pie Chart on the *Energize Montana* Website

Energy efficiency programs will aid in reducing the needed capacity of future additional generation facilities. However, conservation and increased efficiency alone will not eliminate the need for additional generation capacity within the SME service area by 2009. <u>Conservation and efficiency do not generate electricity; they make better use of the electricity that is available.</u> Based on studies conducted around the country, as well as some estimates in Montana, it is reasonable to assume potential reductions in

electricity use from conservation and efficiency improvements are in the 10 percent range without causing economic privation (DEQ, 2004a). This may represent the low end of the potential for conservation/efficiency. However, SME needs to replace approximately 80 percent of its existing supply by 2012; it is not technically feasible that the remaining 20 percent of its supply from WAPA could be stretched widely enough to fully supply all members and customers at a reasonable cost.

Table 2-1. SME System Investments in Energy Conservation in 2004

Investment Type	Beartooth	Fergus	Mid-Yellowstone	Tongue River	Yellowstone Valley	SME Total
Energy audits					$4,595	$4,595
Water heater program					$34,715	$34,715
Conservation education			$1,561		$6,393	$7,954
Demand Side Management			$9,719		$26,991	$36,710
Ground source heating					$11,737	$11,737
Energy-efficient street lighting			$449	$26	$10,263	$10,739
Distribution sys. design > min.[1]		$66,222			$63,441	$129,663
Conservation invest. in power purch. [1]	$100,897	$108,168	$46,020	$147,663	$276,530	$679,278
Totals	$100,897	$174,390	$57,750	$147,689	$434,665	$915,391

Source: SME, 2005b

[1] The last two items in Table 2-1 represent the investments SME's member systems have made on the conservation front through wholesale power purchases. For a number of years (1980s and early 1990s) electric consumers were able to apply for low and no interest loans for the purpose of investing in conservation measures such as home weatherization, installation of energy-efficient heating and cooling systems, efficient motors, etc. These loans were provided by entities such as the BPA, Montana Power Company and others with the cost being passed on to the distribution systems through the wholesale supplier. The members of SME are now repaying costs associated with this regional program. The total investment of $915,391 in 2004 amounts to approximately 4.5 percent of SME's annual wholesale power expense.

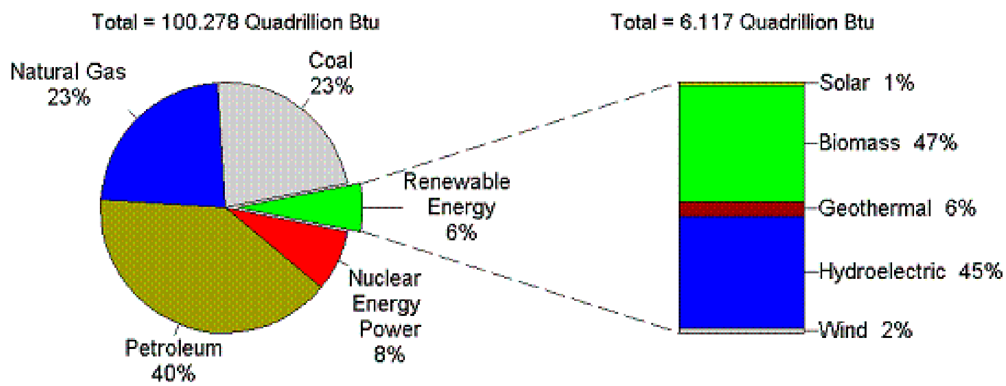
Energy conservation and efficiency programs should be pursued by SME as parallel activities alongside securing additional generation to meet projected demand.

2.1.3 RENEWABLE NON-COMBUSTIBLE ENERGY RESOURCES

The renewable, non-combustible energy resources evaluated in this section are wind, hydroelectric, solar (photovoltaic [PV] and thermal), and geothermal energy. The role of renewable energy sources in the USA's total primary energy supply in 2004 is quantified in Figure 2-3. In total, renewable energy sources supplied 6.1 quadrillion Btu's (quads), or about

six percent, of the nation's total energy consumption of 100.3 quads in 2004 (EIA, 2005d). The electric power cost projections for these energy technologies are shown in Table 2-2.

Figure 2-3. The Role of Renewable Energy Consumption in the Nation's Energy Supply, 2004



Source: EIA, 2005d

Table 2-2: Electric Power Cost ($/MWh) Projections for Renewable, Non-Combustible Energy Resources*

Cost component	Wind	Solar		Hydroelectric	Geothermal[1]
		Photovoltaic	Thermal		
Capital	35.9	N/A	N/A	17.0	N/A
Fixed O & M	7.7	N/A	N/A	2.6	N/A
Variable/Fuel	7.0	N/A	N/A	4.0	N/A
Total Busbar Cost[2]	50.6	350	105	23.6	65

Source: SME, 2004a
**Levelized Costs ($/MWh) for New Utility Generating Plants in Northwest Power Pool (NWPP) Region)*

Levelized cost is the present value of the total cost of building and operating a generating plant over its economic life, converted to equal annual payments; costs are levelized in real dollars, i.e., adjusted to remove the impact of inflation.
Source for Wind Costs: U.S. Department of Energy (DOE) Energy Information Administration (EIA) *Annual Energy Outlook 2004 with Projections to 2025*. Based on the National Energy Modeling System.
Source for Photovoltaic Costs: U.S. DOE Energy Efficiency and Renewable Energy (EERE) State Energy Information – Photovoltaic Technology website: (http:/lwww.eere.energy.gov/state_energy/technology_overview.cfm?techid=1).
Source for Thermal Solar Costs: U.S. DOE Energy Efficiency and Renewable Energy (EERE) State Energy Information – Concentrating Solar Power Technology website: (http:/lwww.eere.energy.gov/state_energy/technology_overview.cfm?techid=4).
Source for Hydroelectric Costs: U.S. DOE Idaho National Engineering and Environmental Laboratory (INEEL) Hydropower Program website: (http:/hydropower.inel.aov/facts/costs-graphs.htm).
Source for Geothermal Costs: U.S. DOE Energy Efficiency and Renewable Energy (EERE) State Energy Information - Geothermal Technology website: (http:/lwww.eere.energy.gov/state_energy/technology_overview.cfm?techid=5).

Notes:
[1] Commercial geothermal resources are not available in the SME service area.
[2] Busbar Cost - wholesale cost to generate power at the plant.
$/MWh - dollars per megawatt hour; O&M - operations and maintenance

2.1.3.1 Wind Energy

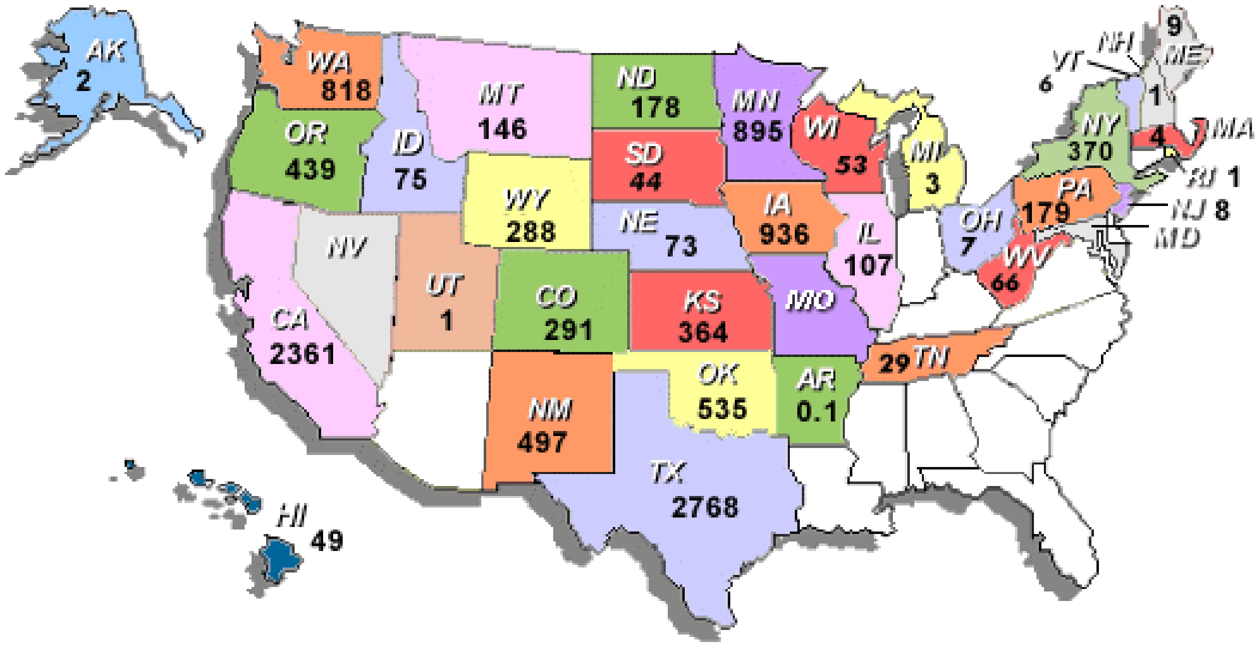
Wind energy offers many advantages and is the fastest-growing renewable energy source in the world, although it still accounts for just 0.25 percent of U.S. power output. Spurred by declining costs and a growing body of local, state, and national "buy-green laws," global wind capacity quadrupled between 1998 and 2003 (Anon., 2003). The development of wind power is increasing in many regions of the United States, including Montana (Figure 2-4). As of 2004, total installed wind electric generating capacity nationwide was 6,374 MW and was expected to generate approximately 16.7 billion kWh (SME, 2004a). See Figure 2-5. Stimulated by the federal Production Tax Credit, which provides wind farm owners with a 1.9-cent credit per kilowatt-hour generated for the first 10 years of operation, installed wind energy capacity in the United States jumped by approximately 2,500 MW in 2005 alone, including two projects in Montana (AWEA, 2005). An additional financial incentive – this one for landowners – is the potential for income from leasing land to wind generators (NWCC, 2005; UCS, 2005). The industry's trade group – the American Wind Energy Association (AWEA) – estimated that by the end of 2005 the USA's wind power capacity was about 9,200 MW, enough to power roughly 2.5 million homes (Halperin, 2005), and 11,600 MW by the end of 2006 (AWEA, 2007). Figure 2-5 shows installed capacity as of December 31, 2006.

Figure 2-4. Modern Wind Turbine at Judith Gap, Montana, Installed in 2005

Wind is a clean energy source that does not pollute the air or produce greenhouse gases like carbon dioxide or atmospheric emissions that can cause acid rain or visibility reduction. Although wind power plants have relatively little impact on the environment compared to conventional power plants, there is some concern over the noise produced by the rotor blades and aesthetic (visual) impacts; furthermore, birds have been killed by flying into the rotors (DOE, 2005c). Avian deaths have become a concern at Altamont Pass in California, which is an area of extensive wind development and also high year-round raptor use. Detailed studies and monitoring following construction at other wind development areas indicate that this may be a site-specific issue. Areas that are commonly used by threatened or endangered bird species may be unsuitable for wind development. Wind energy can also negatively impact birds and other wildlife by fragmenting habitat, both through installation and operation of wind turbines themselves and through the roads and power lines that may be needed (AWEA, 2004).

A 2001 review for the National Wind Coordinating Committee (a collaborative effort of the wind industry, environmental groups, and other stakeholders) of existing studies of avian collisions with wind turbines concluded that avian collision mortality was much lower than other sources of avian collision mortality in the United States (WEST, 2001). This study predicted that even if wind plants became much more numerous and widespread, they would still likely cause no more

Figure 2-5. Total Installed U.S. Wind Power-Generating Capacity by State (2006), in MW



Total installed U.S. wind energy capacity: 11,603 MW as of December 31, 2006
Source: AWEA, 2007

than a few percent of all bird deaths from collision with manmade structures. However, there is not yet a consensus among wildlife biologists more generally as to wind energy's long-term impacts.

A 2005 review of available research by the U.S. Government Accountability Office (GAO, formerly called the General Accounting Office) found that the impact of wind power installations on wildlife generally varies by region and by species. Specifically, studies have shown that wind power facilities in northern California and in Pennsylvania and West Virginia have killed large numbers of raptors and bats, respectively. Studies in other parts of the country have shown comparatively lower levels of mortality, although most facilities have killed at least some birds. However, numerous wind power facilities in the U.S. have not been studied to date, and therefore scientists are unable to reach definitive conclusions about the risk that wind power poses to wildlife in general. Uncertainties remain. Moreover, much is still unknown about migratory bird flyways and overall species population levels, impeding the analysis of the cumulative impact that wind power may have on wildlife species. This field of research is still in its infancy, as is large-scale wind power itself. To date, few studies exist on how to reduce wildlife fatalities at wind power facilities. Overall, based on what is known so far, it does not appear that existing wind power development accounts for a significant amount of bird mortality. Nevertheless, it is premature to conclude that the potential cumulative impact on birds and bats of any widespread expansion of wind power in the country would be insignificant (GAO, 2005).

For its part, the U.S. Fish and Wildlife Service, in its interim guidance on avoiding and minimizing wildlife impacts from wind turbines, states: "…wind energy facilities can adversely

impact wildlife, especially birds and bats, and their habitats. As more facilities with larger turbines are built, the cumulative effects of this rapidly growing industry may initiate or contribute to the decline of some wildlife populations" (USFWS, 2003).

Another issue with some early wind turbine designs was noise, but it has been largely eliminated as a problem through improved engineering and through appropriate use of setbacks from nearby residences. Aerodynamic noise has been reduced by changing the thickness of the blades' trailing edges and by positioning machines "upwind" rather than "downwind" so that the wind hits the rotor blades first, then the tower. (On downwind designs, where the wind hits the tower first, its "shadow" can cause a thumping noise each time a blade passes behind the tower.) A small amount of noise is generated by the mechanical components of the turbine. To put this into perspective, a wind turbine 300 meters away is no noisier than the reading room of a library (AWEA, 2004).

Scenic coastal areas and mountain ridges (Figure 2-6) are often characterized by high wind intensity and good to excellent wind energy potential (DOE, 2005c; Anon., 2001). Thus, certain proposed wind developments have been opposed on the basis of aesthetic or visual resource concerns, most notably in recent years the Cape Wind Project in Nantucket Sound, Massachusetts, which would be the USA's first offshore wind farm (Cape Wind, no date; ACE, 2004). This proposed 130-turbine project would generate approximately 450 MW of clean, renewable energy, yet has split public opinion and environmentalists, drawn bipartisan opposition and support, and even became an issue in Massachusetts' 2006 gubernatorial race (Dennehy, 2005).

Figure 2-6. Wind Farm on West Virginia's Backbone Mountain, Visible from Blackwater Falls State Park

Wind power must compete with conventional generation sources on a cost basis. Wind energy is one of the lowest-priced renewable energy technologies available today. State-of-the-art wind power plants can generate electricity for less than 5 cents/kWh with the Production Tax Credit in many parts of the U.S. (AWEA, 2004). Technological advances have improved the performance of wind turbines and driven down their cost. In locations where the wind blows steadily, the cost of wind power has been shown to compete favorably with coal and natural gas fired power plants, if the full cost including "firming" (see Section 2.2.2.3) is not considered. Even though the cost of wind power has decreased dramatically in the past 10 years, the technology requires a higher initial investment than fossil-fueled generation. Fixed, investment-related costs are the

largest component of wind-based electricity costs. Improved designs with greater capacity per turbine have reduced investment costs to approximately $750-to-$1,000/kW. Wind power plants incur no fuel costs, however, and their maintenance costs have also declined with improved designs. Not including the cost of firming, the Energy Information Administration (EIA) projects the levelized cost of wind power to be approximately $50.6/mWh (refer to Table 2-2).

The big challenge to using wind for electrical power is that it is intermittent and the electricity generated cannot be stored effectively. Thus it is not considered a “firm” resource. Not all winds can be harnessed to meet the timing of electricity demands. Due to the intermittent nature of wind, a wind power plant's economic feasibility strongly depends on the amount of energy it produces. Capacity factor serves as the most common measure of a wind turbine's productivity. Capacity factor is the ratio of the net electricity generated, for the time considered, to the energy that could have been generated at continuous full-power operation during the same period. The capacity factor for wind plants is normally in the 25 to 40 percent range (AWEA, 2004).

Another major issue regarding wind intermittence is that wind power can provide energy, but not on-demand capacity. Even at the best sites, there are times when the wind does not blow sufficiently and no electricity is generated. Related to intermittence is wind's unpredictable nature. Weather forecasting has improved over the past several decades, so wind power plant operators can predict, to some extent, what their output will be by the hour. However, that ability is imperfect at best. Therefore, wind power cannot always be reliably dispatched at the time it is needed. If wind is generating more than about 20 percent of the electricity that a system is delivering in a given hour, the system operator begins to incur significant additional expense because of the need to procure additional equipment that is solely related to the system's increased variability (AWEA, 2004).

Furthermore, wind farms have experienced "quality" issues due to harmonic frequencies (other than 60 cycles) that occur as a result of integrating large amounts of wind into the grid (Muljadi et al., 2004). Power electronics may introduce harmonic distortion of the alternating current in the electrical grid, thereby reducing power quality (DWIA, 2003). In recent testimony at a legislative committee meeting in Helena, a representative of NorthWestern Energy stated they have experienced issues with integration of the large wind farm located at Judith Gap.

Good wind resource areas with accessibility to nearby existing transmission lines do exist; however, it is more common that wind resources are located some distance from adequate transmission lines. Larger wind developments (several hundred megawatts) are more likely to invest in new transmission infrastructure.

Wind turbines can be used in off-grid applications, or they can be connected to a utility power grid. For utility-scale sources of wind energy, a large number of turbines are usually built close together to form a wind farm. In open, flat terrain, a utility-scale wind plant will require about 60 acres (24 hectares) per MW of installed capacity. However, only five percent or less of this area is actually occupied by turbines, access roads, and other equipment, while 95 percent remains free for other compatible uses such as farming or ranching (AWEA, 2004).

Wind is classified according to wind power class, which is based on typical wind speeds. These classes range from class 1 (lowest) to class 7 (highest). In general, a wind power class 4 or higher can be useful for generating power with large (utility-scale) turbines, and small turbines can be used at any wind speed. Class 4 and above are considered good resources. Montana has wind resources consistent with utility-scale production (DOE, 2005i). Good-to-excellent wind resource areas are distributed throughout the eastern two-thirds of Montana (Figure 2-7). The region east of the Rockies in northern Montana has excellent-to-superb wind resource, with other outstanding resource areas being located on the hills and ridges between Great Falls and Havre. The region between Billings and Bozeman also has excellent wind resource areas. Ridge crest locations have the highest resource in the western third of the state (DOE, 2005i).

Although most of SME's service area is rated at class 3 (fair wind resources), areas with a wind power class of 4 or higher are present within the SME service territory. This portion of the SME service area has the potential to support large-scale wind farm facilities with an estimated annual capacity factor of approximately 30 percent. Therefore, it is technically feasible to develop wind farms within the general SME service area (DOE, 2005i).

A 250-MW wind farm would require approximately 18.6 square miles (11,880 acres or 4,752 hectares) of area based on an average power output of 13.47 MW/square mile for wind power class 4 resources (DOE, 2006e). Because of the intermittent nature of wind power and the large land requirements, wind power alone cannot realistically fulfill the need for 250 MW of highly reliable base load capacity. As explained in more depth in Section 2.2.2.3, wind power is uncertain, variable and cannot be dispatched. Wind power facilities generate electricity only when the wind is blowing, with production facility output entirely dependent on variable and inherently unpredictable wind speed. Thus, utilities that use wind power must ensure that they have a backup, or reserve, source of generation capacity to meet loads when wind speed is less than that needed to produce the maximum, or rated, output of the wind power facility. The cost associated with this is called the "firming cost."

"Firming" wind power for sale into the market, or to base load dispatch wind power directly into the system grid in a predetermined load control area, requires a dedicated source of operating and spinning reserve capacity equal to the production ability of the wind resource. Without this, wind power does not meet the fundamental requirements of a dispatchable source of generation, and simply ignoring the associated cost of "firming" renders any economic comparison of wind power to traditional base load generation fundamentally flawed.

Table 2-13 in Section 2.2.2.3, based on price data from the Mid-Columbia energy market, shows that the $35/MWh (after production tax credit) cost of wind power is highly competitive with fossil fuel energy sources. However, the "penalty" of wind's intermittency is a higher overall price ($66.24/MWh) due to having to purchase costly spinning reserve and power (i.e. firming cost) to fill in when the wind is not blowing. Overall, then, this cost, which would be passed onto SME's cooperatives and customers, would be about fifty percent higher than the cost of electricity from the proposed HGS.

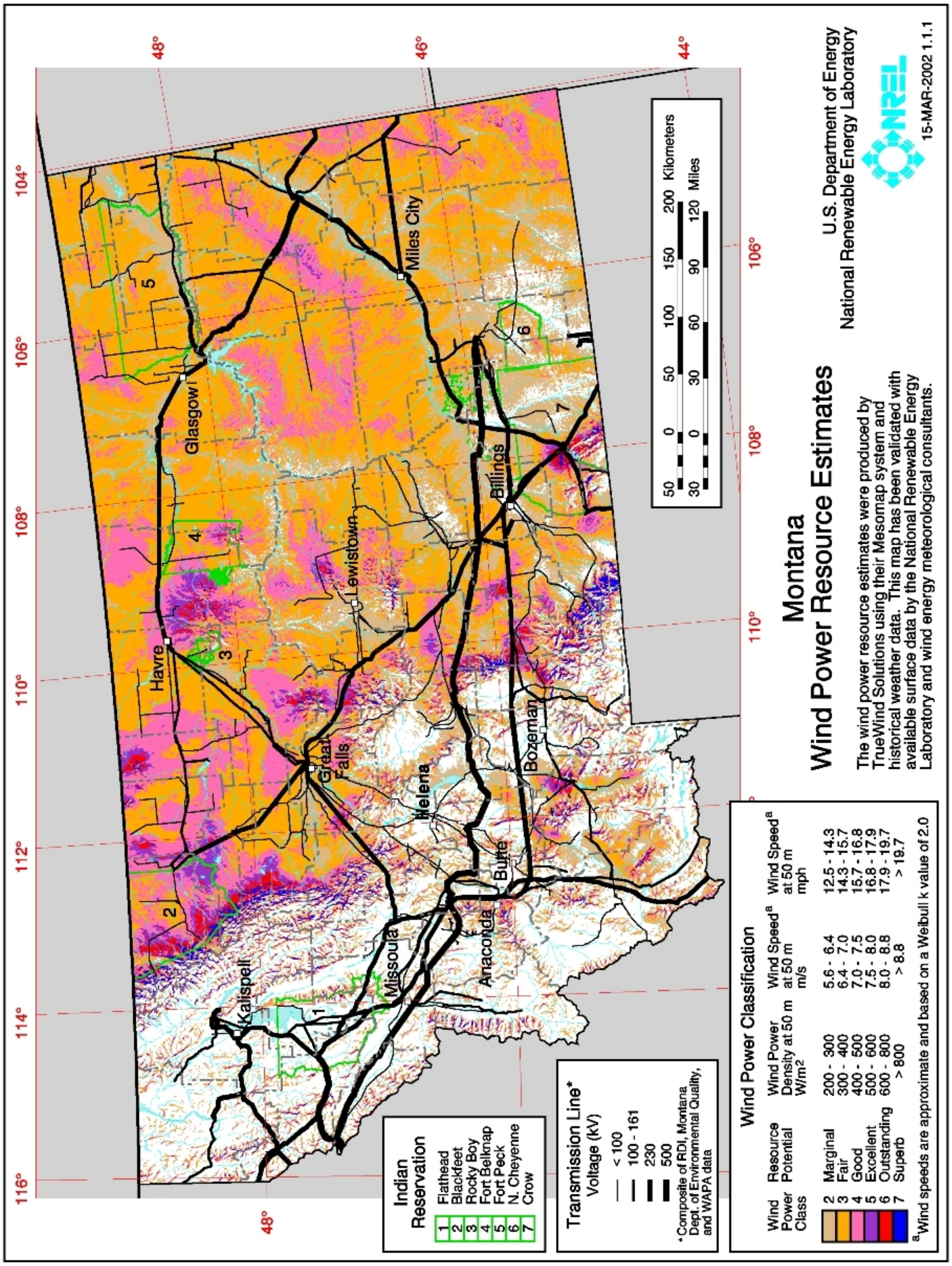


Figure 2-7. Montana Wind Resources (*Source: DOE, 2005i*)

2.1.3.2 Solar Energy


Figure 2-8. Solar Photovoltaic System

Renewable energy technologies can convert solar energy into electricity (Figure 2-8). Solar resources are expressed in watt-hours per square meter per day. This is roughly a measure of how much solar radiation strikes a square meter over the course of an average day.

Flat-plate solar systems are flat panels that collect sunlight and convert it to either electricity or heat. These technologies include photovoltaic (PV) systems, which include a flat-plate collector installed in a tilted position. A flat-plate collector generally obtains the most available solar energy if it is tilted toward the south at an angle equal to the latitude of the location. Because of their simplicity, flat-plate collectors are often used for residential and commercial building applications. They can also be used in large arrays for utility applications.

Concentrating solar power technologies use reflective materials such as mirrors to concentrate the sun's energy (Figure 2-9). This concentrated heat energy is then converted into electricity. Concentrating solar power is the least expensive solar electricity for large-scale power generation (DOE, 2005d). Solar concentrators usually are mounted on tracking systems in order to face the sun continuously. This allows the collectors to capture the maximum amount of direct solar rays. Because these systems usually require tracking mechanisms, solar concentrators are generally used for large-scale applications such as utility or industrial use.

The Western Governors Association (WGA) estimates that, with a longer-term federal investment tax credit and state-based incentives, the western United States could install as much as eight gigawatts (8,000 MW) of solar electric generating capacity by 2015, enough to power four million homes (REA, 2005). According to the WGA, deployment on this scale could also reduce solar costs to a point where they are competitive with power produced from fossil fuels. A WGA task force in 2005 envisioned half of solar deployment developed in central concentrating solar power plants and half developed in distributed PV generation. According to the U.S. DOE however, Montana's climate and northern latitude render it a marginal resource for solar concentrators (DOE, 2005d). The most promising role for solar energy in Montana may not be in centralized, utility-operated power plants, but rather in distributed applications such as hot water and space heating, as well as electricity generation in residences, commercial buildings, farms, and ranches.


Figure 2-9. Concentrating Solar Power (solar thermal trough) System in California's Mojave Desert

Utilizing solar energy generally produces environmental benefits (NCAT, no date). It is both renewable and sustainable. There are no major water discharge issues and no major direct air emissions related to the installation of a solar facility. Carbon emissions are avoided, as are SO_2 and NOx emissions. There could be minor sources of air emissions resulting from the installation of miscellaneous support equipment such as diesel/natural gas emergency generators. The fact that the structures associated with solar energy installations are generally not nearly as tall as modern wind turbines means that they have not generated the same concern and controversy over aesthetic impacts as have wind farms. Likewise, solar energy facilities have not been implicated in bird and bat kills, as have some wind facilities. However, within the confined footprint of development, centralized solar energy facilities virtually eliminate native habitat.

A 250-MW PV solar farm located in the best area of Montana for solar power would require approximately 310 acres (125 hectares), or less than 0.5 square mile (1.3 sq. km) (SME, 2004a). The aesthetic effects of a facility of this relatively small size would be unlikely to generate public concern and controversy.

Fixed, investment-related charges are the largest component of solar-based electricity costs. The DOE Energy Information Administration projects the capital cost component of the levelized cost of solar power to be approximately $350/mWh for PV and $105/mWh for thermal solar (SME, 2004a). Solar power units incur no fuel costs. Maintenance costs are low for PV systems but are high for thermal solar applications.

Due to the intermittent nature of solar power, economic feasibility strongly depends on the amount of energy it produces. Capacity factor serves as the most common measure of solar power productivity. Estimates of capacity factors range from 20 to 35 percent. Because solar power is dependent on the weather, it is unpredictable and cannot offer on-demand capacity.

Solar power alone could not reasonably fulfill the need for 250 MW of a reliable base load capacity within the SME service area for the reasons discussed above. In particular, Montana has a marginal solar resource, and solar power production in the SME service area would be intermittent.

2.1.3.3 Hydroelectricity

The most common type of hydroelectric power plant uses either a dam on a river to store water in a reservoir or a run of the river approach, which does not result in the construction of a large reservoir (Figure 2-10) (DOE, 2001). Water released from the reservoir flows through a turbine, which in turn activates a generator to produce electricity. Another type of hydroelectric power plant is referred to as a pumped storage plant. The plant turbines turn

Figure 2-10. Bureau of Reclamation's Hungry Horse Dam & Reservoir on the South Fork of the Flathead River near Kalispell, Montana

backward to pump water from a river or lower reservoir to an upper reservoir, where the potential energy is stored. To use the energy, the water is released from the upper reservoir back down into the river or lower reservoir. This turns the turbines forward, activating the generators to produce electricity (DOE, 2005e).

To have a usable hydropower resource, there must be both a large volume of flowing water and a change in elevation. Due to the seasonal nature of hydropower, the average annual capacity factor for most facilities is approximately 40 to 50 percent. Another major issue regarding hydropower is its year-to-year unpredictable output due to annual rainfall variability.

There are no major direct air emissions related to the utilization of hydroelectric resources. There could be minor sources of air emissions resulting from the installation of miscellaneous support equipment such as diesel/ natural gas emergency generators. The major impacts would likely be to the aquatic environment, alteration of river flows, and land use alterations. The construction of an impoundment or reservoir could have various adverse impacts on water quality, wetlands, flooding of bottomland and upland habitats or agricultural areas, and aquatic biota (EPA, 2005a). Fish populations can be impacted if adults cannot migrate upstream past impoundment dams to spawning grounds or if juveniles cannot migrate downstream. (This is much more of an issue west of the continental divide, where Pacific salmon stocks occur.) Fish injury and mortality can also result from passage through turbines. Advanced turbine technology reduces fish mortality resulting from turbine passage to less than two percent, in comparison with turbine-passage mortalities of 5 to 10 percent for the best existing turbines and 30 percent or greater from other turbines (INL, 2005a). Advanced turbine technology also can maintain downstream dissolved oxygen levels to help ensure compliance with water quality standards.

Fixed, investment-related charges are the largest component of hydroelectric power plant costs. The DOE's Idaho National Engineering and Environmental Laboratory (INEEL) reports hydropower capital costs to be $1,700 to $2,300/kW. Operating and maintenance costs are low for hydropower. The total levelized cost of hydropower is projected to be approximately $24/MWh (refer to Table 2-2).

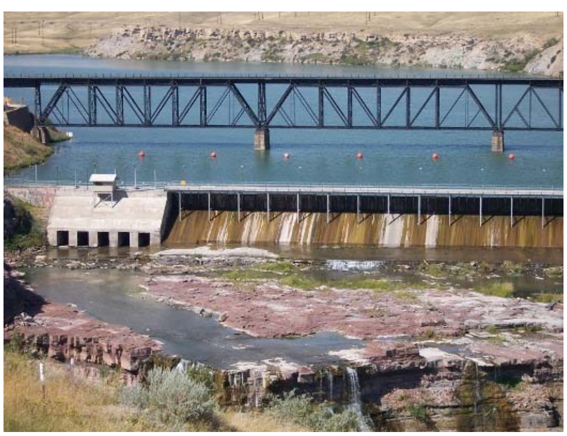


Figure 2-11. One of PPL Montana's Great Falls Dams that Generate Hydroelectricity along the Missouri River (Rainbow Dam at Rainbow Falls)

One of the principal issues facing hydropower is the extent to which additional expansion of capacity is even possible or realistic, due to opposition by environmental groups to further development of U.S. rivers. A 1998 study by the INEEL for the U.S. DOE modeled undeveloped hydropower capacity on a national basis, for the first time taking into account environmental, legal, and institutional constraints (Connor et al., 1998). Whereas past efforts to quantify undeveloped U.S. hydropower capacity ranged across an order of magnitude, from approximately 50,000 MW to almost 600,000 MW, the more realistic 1998 assessment identified 5,677 sites with a total

undeveloped capacity of approximately 30,000 MW. According to this study, 158 hydroelectric projects with an adjusted, undeveloped capacity of 1,014 MW could be developed in Montana (Table 2-3). The projects include:

- expansions of existing power projects;
- developing hydropower projects at existing dams; and
- projects at undeveloped sites.

There are five small, historic run of the river hydroelectric dams along the series of waterfalls that constitute the Great Falls of the Missouri River: Black Eagle (21 MW), Cochran (60 MW), Morony (48 MW), Ryan (60 MW), and Rainbow (36 MW). These are owned by Pennsylvania Power and Light-Montana (PPL Montana) and have a combined generation capacity of 225 MW (PPL Montana, 2006). The power generated by these facilities is sold under contract and the entire amount needed to meet SME's requirements is not available at any time in the foreseeable future to SME. In recent decades, the generating facilities in several of these dams were upgraded, increasing their capacity, but further expansion of hydropower generation at these facilities by either enlarging dams/reservoirs or turbine generators is probably not realistic.

Because of the lack of significant precipitation, runoff, and topographic relief in south-central and southwestern Montana, the region lacks the undeveloped hydroelectric resources capable of providing 250 MW of generation from a single power plant. Attempting to provide 250 MW in a timely fashion by constructing multiple facilities would likely be rendered infeasible by the lengthy Federal Energy Regulatory Commission (FERC) licensing process and possible delays resulting from opposition by environmental groups (FERC, 2005).

Table 2-3. Unadjusted and Adjusted Undeveloped Hydropower Capacity in Montana

Category	Number of Projects	Unadjusted, undeveloped capacity (MW)	Adjusted, undeveloped capacity (MW)
Developed sites with existing power	7	470	235
Developed (dammed) sites without existing power	72	1,129	502
Undeveloped sites	79	2,073	277
State total	158	3,672	1,014

Source: Connor et al., 1998
"Unadjusted, undeveloped capacity" refers to downward adjustments to hypothetical capacity unadjusted for environmental, legal, and institutional constraints

2.1.3.4 Geothermal Energy

Around the world, geothermal energy – "heat from the earth" – is a proven resource both for direct heat and power generation (World Bank, no date). This energy source is contained in underground reservoirs of steam, hot water, and hot dry rocks. Two types of geothermal

Figure 2-12. CalEnergy Navy I Flash Power Plant at the Coso Geothermal Field in California (85 MW net capacity)

resources are being tapped commercially: hydrothermal fluid resources and earth energy. Hydrothermal fluid resources, which are reservoirs of steam or very hot water, are well suited for electricity generation. Due to the remote locations of many geothermal resources, the cost of transmission may make development of these energy sources more expensive than a facility that is closer to an identified interconnection point. Earth energy, the heat contained in soil and rocks at shallow depths, is excellent for direct use and geothermal heat pumps but not as a source of electric power generation.

Producing electricity from geothermal resources involves a mature technology. Approximately 8,000 MW of geothermal electric capacity are currently in service around the world, including approximately 2,200 MW of capacity in the United States. All of the geothermal power in the U.S. is generated in California, Nevada, Utah, and Hawaii, with California accounting for over 90 percent of installed capacity. A considerable amount of this – 1,137 MW – is generated at one northern California facility, the Geysers. This site is an ideal and fairly unusual resource because its wells produce virtually all steam with little water carry over.

In general, geothermal reservoirs are classified as either low temperature (<150° C) or high temperature (>150° C). The high temperature reservoirs are most suited for commercial production of electricity. Three types of geothermal plants have been developed: dry steam, flash steam, and binary. Dry steam power plants, the first kind to be developed, use the steam from the geothermal reservoir as it comes from wells, routing it directly through turbine/generator units to produce electricity. In flash steam plants, the most prevalent type of geothermal electric plant in operation today, water at temperatures greater than 360° F (182° C) is pumped under high pressure to the generation equipment at the ground surface. Upon reaching this equipment the pressure is suddenly reduced, allowing some of the hot water to convert or "flash" into steam. This steam is then used to power the turbine/generator units and produce electricity. The remaining hot water not flashed into steam, and the water condensed from the steam, are generally pumped back into the reservoir (INL, 2005b).

Binary cycle power plants differ from dry steam and flash steam systems in that the water or steam from the geothermal reservoir never comes into contact with the turbine/generator units. Rather, the water from the geothermal reservoir is used to heat another "working fluid," which is vaporized and used to turn the turbine/generator units. The geothermal water and the "working fluid" are each confined in separate circulating systems or "closed loops." The advantage of the binary cycle system is that it can operate with lower temperature waters (225° F - 360° F), by using working fluids that have an even lower boiling point than water. Binary cycle power plants also produce no air emissions (INL, 2005b).

Geothermal energy is generally one of the cleaner forms of energy available for commercial applications. Small direct heat resources have minimal air and water emissions. Large geothermal resources utilized for electrical generation have air emissions consisting primarily of hydrogen sulfide (H_2S), ammonia (NH_3), and methane (CH_4). These developed projects also have water discharges, and would need additional controls to minimize emissions. New designs are able to minimize emissions within the process and with the use of add-on emissions control equipment. The high flow rates of steam and water from geothermal wells can result in the precipitation of various compounds on the steam generating and turbine equipment. These precipitates are primarily silica. Frequent cleaning of the equipment would result in land disposal of the precipitates. Land use for geothermal resources is normally small compared to fossil energy resources. A 20- MW geothermal power plant would require approximately three acres (1.2 hectares). Therefore, 13 of these plants having a total output of 250 MW would require a total area of approximately 39 acres (16 hectares).

Montana has low to moderate temperature resources that could be tapped for direct heat or for geothermal heat pumps. However, electric generation is not possible with these resources because the temperature is too low to be suitable for commercial generation. Therefore, geothermal electric power cannot fulfill the need for 250 MW of highly reliable base load capacity within the SME service area because commercial geothermal resources for the generation of electric power are not available in the state (DOE, 2004b).

2.1.4 RENEWABLE COMBUSTIBLE ENERGY RESOURCES

The renewable combustible energy resources evaluated in this section are biomass, biogas, and municipal solid waste (MSW). The electric power cost projections for these energy technologies are shown in Table 2-4.

Table 2-4. Electric Power Cost ($/MWh) Projections for Renewable, Combustible Energy Resources*

Cost Component	Biomass	Biogas	Municipal Solid Waste
Capital	N/A	37.0	32.8
Fixed O&M	N/A	6.6	38.9
Variable/Fuel	N/A	3.0	13.0
Total	90.0	46.5	84.8

Source: SME, 2004a
*Levelized Costs ($/MWh) for New Utility Generating Plants in NWPP Region

Source for Biomass Costs: U.S. Department of Energy (DOE) Energy Efficiency and Renewable Energy (EERE) State Energy Information - Biomass Power Technology website:(http://www.eere.energy.gov/state_energyttechnology_overview.cfm?techid=3)

Source for Biogas Costs: U.S. DOE Energy Information Administration (EIA) *Annual Energy 2003 Outlook* Reference Case. Based on the National Energy Modeling System (NEMS).
$/MWh - dollars per megawatt hour

A significant environmental issue for these renewable, combustible technologies is air emissions. Table 2-5 documents projected emissions of key air pollutants from a hypothetical 250-MW power plant using biomass and municipal solid waste as fuel.

2.1.4.1 Biomass

The term "biomass" means any plant-derived organic matter available on a renewable basis, including dedicated energy crops and trees, agricultural food and feed crops, agricultural crop wastes and residues, wood wastes and residues, aquatic plants, animal wastes, municipal wastes, and other waste materials. Biomass can be used to provide heat, make fuels, chemicals and other products, and generate electricity. Bio-energy ranks second (to hydropower) in renewable U.S. primary energy production and accounts for three percent of the primary energy production in the United States (DOE, 2005f). However, on an equivalent heat basis, biomass actually ranks first among renewable energy sources. (Refer to Figure 2-3.)

Table 2-5. Estimated Annual Air Emissions (tons/year) for a 250-MW Generating Station Using Biomass or Municipal Solid Waste[1]

Technology	Sulfur dioxide (SO_2)	Nitrogen oxides (NOx)	Carbon monoxide (CO)	Particular Matter (PM_{10})	Hazardous Air Pollutants (HAPs)	Mercury (Hg)	GHGs[2]
Biomass	274	2,409	6,570	810	427	0.038	342[3]
Municipal Solid Waste	439	4,886	1,911	132	54	0.29	2,668,000

Source: SME, 2004a; EPA, 2003l; EPA, 1996

[1]For biomass, based on 250-MW wood-fired boiler with low-NO_X burners and fabric filter; average fuel heating value of 6,500 British thermal units (Btu) per pound (lb). For municipal solid waste, based on mass burn water well combustor, 4,500 Btu/lb; 2,443,000 tons refuse derived fuel per year (RDF/yr); Lime Spray Dryer, Fabric Filter, and Selective Catalytic Reduction (at 80 percent control); AP-42, Section 2.1 emission factors.

[2]Greenhouse Gases

[3] CO_2 emitted from this source is generally not counted as greenhouse gas emissions because it is considered part of the short-term CO_2 cycle of the biosphere (USEPA, 2003l).

Heat can be used to chemically convert biomass into a fuel oil, which can be burned like petroleum to generate electricity. Biomass can also be burned directly to produce steam for electricity production or manufacturing processes. In a power plant, a turbine utilizes the steam to turn a generator that converts the energy into electricity. Some coal-fired power plants use biomass as a supplemental energy source in high-efficiency boilers to significantly reduce emissions (DOE, 2005f).

Biomass can also produce gas for generating electricity. Gasification systems use high temperatures to convert biomass into a gaseous mixture of hydrogen, carbon monoxide, and methane. The gas then fuels a combustion turbine, which is very much like a jet engine, except that it turns an electric generator instead of propelling a jet. The decay of biomass in landfills also produces a gas – methane (CH_4) – that can be burned in a boiler to produce steam for electricity generation or for industrial processes (DOE, 2005f).

Wood is the most commonly used biomass fuel for heat and power and is an available biomass resource in Montana. The most economic sources of wood fuels are usually urban residues and mill residues. Urban residues used for power generation consist mainly of chips and grindings of

clean, non-hazardous wood from construction activities, woody yard and right-of-way trimmings, and discarded wood products such as waste pallets and crates. Mill residues, such as sawdust, bark, wood scraps, and sludge from paper, lumber, and furniture manufacturing operations are typically very clean and can be used as fuel by a wide range of biomass energy systems. These forest industries exist in Montana, and offer potential fuel sources for power generation. However, these waste materials are often burned in boilers at the plants themselves to produce thermal and/or electric power used to run the mills.

Biopower technologies are proven electricity generation options in the United States, with 10 gigawatts (10,000 MW) of installed capacity. All of today's capacity is based on mature, direct-combustion technology. Direct combustion involves the burning of biomass with excess air, producing hot flue gases that are used to produce steam in the heat exchange sections of boilers. The steam is used to produce electricity in steam turbine generators (DOE, 2005f).

The primary pollution issue in utilizing biomass to generate electricity is the control of air emissions. Co-firing of biomass fuels in a coal-fired boiler is advantageous from a renewable energy point of view as well as an alternative to land disposal of biomass as a solid waste. Biomass used as 5-15 percent of the fuel input in the co-firing of a coal-fired boiler would have similar air emissions and control requirements as those for a conventional pulverized coal or circulating fluidized bed boiler discussed later in this chapter. A 250 MW biomass-only fired boiler would have estimated air emissions shown in Table 2-5. While a biomass-fired boiler would have relatively low emissions of sulfur dioxide (SO_2), emissions of nitrogen oxides (NOx), carbon monoxide (CO), particulate matter (PM), and hazardous air pollutants (HAPs) would typically be higher than conventional coal-fired boilers or natural gas-fired combustion turbines.

The cost to generate electricity from biomass varies depending on the type of technology used, the size of the power plant, and the cost of the biomass fuel supply. In today's direct-fired biomass power plants, generation costs are approximately $90/MWh. Co-firing is an emerging technology that has been evaluated for a variety of boiler technologies, including pulverized coal, cyclone, fluidized bed and spreader stokers. Co-firing refers to the practice of introducing biomass in high-efficiency, coal-fired boilers as a supplemental energy source. For utilities and power generating companies with coal-fired capacity, co-firing with biomass may represent one of the least-cost renewable energy options (DOE, 2005g). For biomass to be economical as a fuel for electricity, the source of biomass must be located near the power generation facility to reduce transportation costs.

SME examined the possibility of a 20-MW biomass facility utilizing wood waste from pulp mills in Montana and concluded it was not feasible due to the location and uncertainties associated with the wood waste supply. For biomass to be economical as a fuel to generate electricity, the source of biomass must be located close to the power plant. This reduces transportation costs; the preferred system has transportation distances below 100 miles (approx. 260 sq. km). The most economical conditions exist when the energy use is located at the site where biomass residues are generated (i.e., at a paper mill or sawmill). These conditions do not exist in the SME service area. Thus, SME concluded that a 250-MW biomass facility would not be cost-

effective compared to a conventional, pulverized coal-fired or circulating fluidized bed power plant (SME 2004a). RD and DEQ concur with this conclusion.

2.1.4.2 Biogas

Biomass gasification for power production involves heating biomass in an oxygen-starved environment to produce a medium or low calorific gas. This biogas is then used as fuel in a combined cycle power generation plant that includes a gas turbine topping cycle and a steam turbine bottoming cycle (DOE, 2005g).

Anaerobic digestion by anaerobic bacteria (whose survival requires an environment devoid of oxygen) is a naturally-occurring process (CanREN, 2003). “Swamp gas,” which contains methane, is produced by the anaerobic decomposition of wetland vegetation that has settled to the bottom of a marsh, swamp or other wetland. Environmental concerns and rising energy costs for energy and for wastewater treatment have led to a resurgence of interest in anaerobic treatment and new interest in using biogas produced during this treatment of organic wastes.

The same types of anaerobic bacteria that produce natural gas also produce methane-rich biogas today. Anaerobic bacteria break down or "digest" organic material in a two-step process. The first step is to break down the volatile solids in a waste stream to fatty acids. The second stage of the process is environmentally sensitive to changes in temperature and pH and must be free of oxygen to produce biogas as a waste product. The anaerobic processes can be managed in a "digester" (an airtight tank) or a covered lagoon (a pond used to store manure) for waste treatment. The primary benefits of anaerobic digestion are nutrient recycling, waste treatment, and odor control. Except in very large systems, biogas production is considered a secondary benefit.

In most cases, the methane produced by the digester is well-concentrated. Because methane is the principal component of natural gas, it is an excellent source of energy for use either in cogeneration on the electrical grid or simply for fueling boilers at the wastewater treatment plant. The methane captured from an anaerobic digester will naturally contain some impurities, chiefly sulfur, which should be scrubbed prior to pressurization and combustion. Anaerobic digesters are used in municipal wastewater treatment plants and on large farm, dairy, and ranch operations for disposal of animal waste.

Landfill biogas (LFG) is created when organic waste in a landfill naturally decomposes. This gas consists of about 50 percent methane, about 50 percent carbon dioxide, and a small amount of non-methane organic compounds. Instead of allowing LFG to escape into the air, it can be captured, converted, and used as an energy source. Using LFG helps to reduce odors and other hazards associated with LFG emissions, and it helps prevent methane from migrating into the atmosphere and contributing to local smog and global climate change.

The various types of biogas can be collected and used as a fuel source to generate electricity using conventional generating technology. Production of electric power from both digester gas and landfill gas has been demonstrated commercially for many years. The DOE Energy Information Administration projects the capital cost component of the levelized cost of biogas

power to be approximately $37/MWh in 2009. The total levelized cost of biogas power is projected to be approximately $46/MWh (refer to Table 2-4).

Using digester or landfill gas as a fuel in a turbine is environmentally beneficial because biogas is a renewable resource. Pretreatment of the digester or landfill gas is very important to the long-term viability of the engines or turbines. The gas is typically treated to remove hydrogen sulfide, siloxanes, moisture, and particulates prior to combustion. The primary environmental compatibility issue is the air emissions produced by combustion. Air emissions for a turbine firing digester or landfill gas are similar to those of a natural gas-fired combustion turbine. The use of Selective Catalytic Reduction (SCR) for nitrogen oxide (NOx) control and catalytic oxidation for carbon monoxide (CO) control may be required. There are no major issues with biogas concerning water discharge or solid waste/hazardous waste generation. A 20-MW biogas facility would require approximately three acres (1.2 ha). Therefore, 13 of these plants having a total output of 250 MW would require a total area of approximately 39 acres (16 ha).

The current U.S. Environmental Protection Agency (EPA) Landfill Methane Outreach Program landfill and project database lists four landfill sites in Montana that have the potential for a landfill gas to electric power project. Two of the landfills are located within or near the SME service territory. One is located in Bozeman (owned and operated by the City of Bozeman), which is near the service territory and the other is located in Great Falls (owned and operated by Montana Waste Systems) which is within the service territory. The other two landfill locations are located at Missoula and Kalispell which are considerable distances to the SME service area. There are no landfills in Montana currently using landfill gas for energy production. The ability of a landfill to use the LFG for power generation is based on the rate of gas production. Gas production is dependent on the volume of waste in place, the age of the waste, and the moisture content of the waste. Landfills in Montana are dry and produce less gas than landfills in other parts of the country. Because of its low population, the total volume of waste produced in Montana is less than about 43 other states.

For SME or other Montana electric generation utilities, the key issues for biogas facilities are the dispersed locations and insufficient quantities of the fuel source. The City of Great Falls is currently developing a small-scale biogas generating facility in conjunction with its wastewater treatment plant. The amounts of digester gas and landfill gas resources are too limited within the SME service area for biogas power to fulfill the need for 250 MW of highly reliable base load capacity.

2.1.4.3 Municipal Solid Waste

The municipal solid waste industry includes four components: recycling, composting, landfilling, and waste-to-energy via incineration. Municipal Solid Waste (MSW) is total waste excluding industrial waste, agricultural waste, and sewage sludge. Medical wastes from hospitals and items that can be recycled are also generally excluded from MSW used to generate electricity. As defined by the U.S. EPA, MSW includes durable goods, non-durable goods, containers and packaging, food wastes, yard wastes, and miscellaneous inorganic wastes from residential, commercial, institutional, and industrial sources. Examples from these categories include: appliances, newspapers, clothing, food scraps, boxes, disposable tableware, office and classroom

paper, wood pallets, rubber tires, and cafeteria wastes. Waste-to-energy combustion and landfill gas are byproducts of municipal solid waste (EIA, 2005e).

MSW can be directly combusted in waste-to-energy facilities to generate electricity. Because no new fuel sources are used other than the waste that would otherwise be sent to landfills, MSW is often considered a renewable power source. Although MSW consists mainly of renewable resources such as food, paper, and wood products, it also includes nonrenewable materials derived from fossil fuels, such as tires and plastics (EPA, 2005b).

At the power plant, MSW would be unloaded from collection trucks and shredded or processed to ease handling. Recyclable materials would be set aside, and the remaining waste would be fed into a combustion chamber to be burned. The heat released from burning the MSW would be utilized to produce steam, which turns a steam turbine to generate electricity.

Burning MSW produces nitrogen oxides, CO_2, and SO_2 as well as trace amounts of toxic pollutants, such as mercury compounds and dioxins. Variability in the composition of MSW affects the emissions produced. For example, if MSW containing batteries and tires is burned, toxic materials can be released into the air. A variety of air pollution control technologies are used to reduce toxic air pollutants from MSW power plants (EPA, 2005b). Estimated emissions of criteria air pollutants from a 250-MW MSW electric-generation facility are comparable or lower than a coal-fired resource, however, the emissions of hazardous air pollutants including mercury, cadmium, and toxic organics are considerably higher.

Power plants that burn MSW are normally smaller than fossil fuel power plants but typically require a similar amount of water per unit of electricity generated. Similar to fossil fuel power plants, MSW power plants discharge used water. Pollutants build up in the water used in the power plant boiler and cooling system. In addition, the cooling water is considerably warmer when it is discharged than when it was taken. This discharge would require a permit and would have to be monitored (EPA, 2005b).

MSW power plants reduce the need for landfill capacity because disposal of ash created by MSW combustion requires less volume and land area as compared to unprocessed MSW. However, because ash and other residues from MSW operations may contain toxic materials, the power plant wastes must be disposed of in an environmentally safe manner to prevent toxic substances from migrating (leaching) into groundwater supplies. Current regulations require MSW ash sampling on a regular basis to determine its hazardous status. Hazardous ash must be managed and disposed of as hazardous waste. Depending on state and local restrictions, non-hazardous ash may be disposed of in a MSW landfill or recycled for use in roads, parking lots, or daily covering for sanitary landfills (EPA, 2005b).

The United States has approximately 90 operational MSW-fired power generation plants, generating approximately 2,500 megawatts, or about 0.3 percent of total national power generation. However, because construction costs of new plants have increased, economic factors have limited new construction (EPA, 2005b). The capital cost of an MSW power project is approximately $3,500 to $4,000/kW. The total levelized cost of MSW power is projected to be approximately $85/mWh (refer to Table 2-4). Typically, MSW power plants become

economical only when landfills for MSW disposal are not available near the collection area and hauling costs become excessive. The MSW power plants can command a tipping fee to offset the high cost of power production, but these need to be in the $50 to $60/ton range in order for the plant to be competitive. These conditions exist in populous areas such as New York City.

Except for small, localized areas, the potential for economical power to be generated in Montana from MSW does not exist. SME serves rural areas and does not have a municipal customer base large enough to support a municipal solid waste-to-energy project (SME, 2004a). There are currently no MSW incinerators operating in the State of Montana.

2.1.5 Non-Renewable Combustible Energy Resources

The non-renewable combustible energy resources evaluated in this section are Natural Gas Combined Cycle (NGCC), microturbines, Pulverized Coal (PC), Integrated Gasification Combined Cycle (IGCC) coal, oil, and nuclear. The electric power cost projections for the first five of these energy technologies are documented in Table 2-6 below.

As with the renewable, combustible technologies discussed above, a significant environmental issue for the non-renewable, combustible technologies is air emissions. Table 2-7 documents projected emissions of key air pollutants from a hypothetical 250-MW power plant from non-renewable, combustible energy sources.

Table 2-6. Electric Power Cost Projections for Non-Renewable, Combustible Energy Resources*

	Levelized Costs ($/MWh)				
Cost Component	Natural Gas Combined Cycle (NGCC)	Microtubines	Subcritical Pulverized Coal (PC) Powder River Basin (PRB) Coal	Circulating Fluidized Bed (CFB) Powder River Basin (PRB) Coal	Integrated Gasification Combined Cycle (IGCC) Bituminous Coal
Capital	19.0	49.1	33.8	25.2	42.8
Fixed O&M	2.3	8.4	4.6	4.6	3.3
Variable / Fuel	41.0	55.7	11.7	12.8	19.8
Total Bus-bar Cost[1]	62.3	113.2	50.1[2]	42.6	65.9

Source: SME 2004a
**Levelized Costs for New 250 MW Power Plant (Microturbines @ 30 kW), 90 Percent Capacity Factor*
[1] Busbar Cost-wholesale cost to generate power at the plant.
[2] EIA, 2004a: Table 21 for Advanced Coal plant.
$/mWh dollars per megawatt hour
O&M operations and maintenance

Table 2-7. Estimated Annual Air Emissions (tons/year) for a Gross 250 MW Generating Station, from Non-Renewable, Combustible Energy Sources[1]

Technology	Sulfur dioxide (SO_2)	Nitrogen oxides (NOx)	Carbon monoxide (CO)	Particulate Matter (PM_{10})	Hazardous Air Pollutants (HAPs)	Mercury (Hg)	GHGs[2]
NGCC[3]	30	87	131	58	9	---	963,000
Microturbines	83	83	1,250	83	---	---	1,691,666
Pulverized coal	1,330[6]	887[6]	1,330[6]	166	33	0.05	1,941,000
CFB[4] coal	142[7]	887[7]	710[7]	89[7]	18[7]	0.05[8]	1,941,000[9]
CFB (HGS)[10]	437	805	1,150	299	43.7	0.02	2,100,000
IGCC[5] coal	1,242	790	364	133	NA	0.05	1,553,000

Source: SME, 2004a (updated April 2005) and Supplemental Draft Air Quality Permit #3423-00

[1]For natural gas combined cycle, based on 250-MW Combined Cycle Turbine; 8,000 Btu/gross kWh heat rate; 90% NOx removal with selective catalytic reduction (SCR); AP-42 Section 3.1 emissions factors. For microturbines, based on summed emissions of 8,333 microturbines, each 30 kW in size; 0.437 MMBtu/hr heat input; 80% capacity factor; Dry Low NOx combustion; emission factors based on AP-42 Section 3.1 and EPA paper, *Technology Characterization: Microturbines,* March 2002. For pulverized coal, based on pulverized coal boiler, Powder River Basin (PRB) coal 8,000 British thermal units (Btu)/pound; 9,000 Btu/gross kilowatt hours (kWh) heat rate; 1,108,700 tons/yr coal; lime spray dryer, fabric filter and selective catalytic reduction; AP 42 emissions factors; U.S. Department of Energy (DOE) Energy Information Agency (EIA) Carbon Dioxide (CO_2) factor of 1,970 lb/megawatt hours (MWh). For circulating fluidized bed coal, based on circulating fluidized bed boiler; Powder River Basin (PRB) coal 8,000 British thermal units (Btu)/pound (lb); 9,000 Btu/gross kilowatt hours (kWh) heat rate; 1,108,700 tons/yr coal; limestone flash dryer absorber desulphurization, fabric filter and selective non-catalytic reduction. For integrated gasification combined cycle coal, emissions are based on Tampa Electric Polk Power Station IGCC Project. HAPs emissions were not reported but are expected to be lower than a conventional pulverized coal boiler but higher than a conventional natural gas combined cycle turbine. Carbon dioxide emissions are estimated to be 20% less than conventional pulverized coal boiler.
[2]Greenhouse Gases
[3]Natural Gas Combined Cycle
[4]Circulating Fluidized Bed
[5]Integrated Gasification Combined Cycle, testing eastern coals with higher sulfur content.
[6]These emissions values were extracted from recent air permits issued in the state of Montana and were found to be comparable with the AP42 emissions factors.
[7] Information obtained from CFB boiler suppliers.
[8]AP42 Emissions Factors.
[9]U.S. DOE EIA carbon dioxide factor of 1970 lb/megawatt hours (MWh).
[10] Proposed permit limits from Supplemental HGS Draft Air Quality Permit #3423-00, 270 gross MW.

2.1.5.1 Natural Gas Combined Cycle

Natural gas combined cycle power plants generate electricity using two cycles – the steam cycle and the gas cycle (PF, 2005). In the steam cycle, fuel is burned to boil water and create steam which turns a steam turbine, driving a generator to create electricity. In the gas cycle, gas is burned in a gas turbine which directly turns a generator to create electricity (refer to Figure 2-13). Combined cycle power plants operate by combining these two cycles for higher efficiency; that is, a higher percentage of the innate chemical energy of the fuels is converted into heat and kinetic energy. The hot exhaust gases exiting the gas turbine are routed to the steam cycle and are used to heat or boil water. These exhaust gases typically carry away up to 70 percent of the energy in the fuel before it was burned, so capturing what otherwise would be wasted can double

overall efficiency from 30 percent for a gas cycle only plant to 60 percent using the newest combined cycle technology (PF, 2005).

Gas turbines for electric utility services generally range from a minimum of 20 MW for peaking service up to the largest machines for use in combined cycle mode. In the early 1990's natural gas played a major role as a heating fuel of choice for homes and commercial and business establishments, and also became the premier fuel for new electric generation. Natural gas was easy to locate, economical, and more environmentally friendly than coal or oil. During this

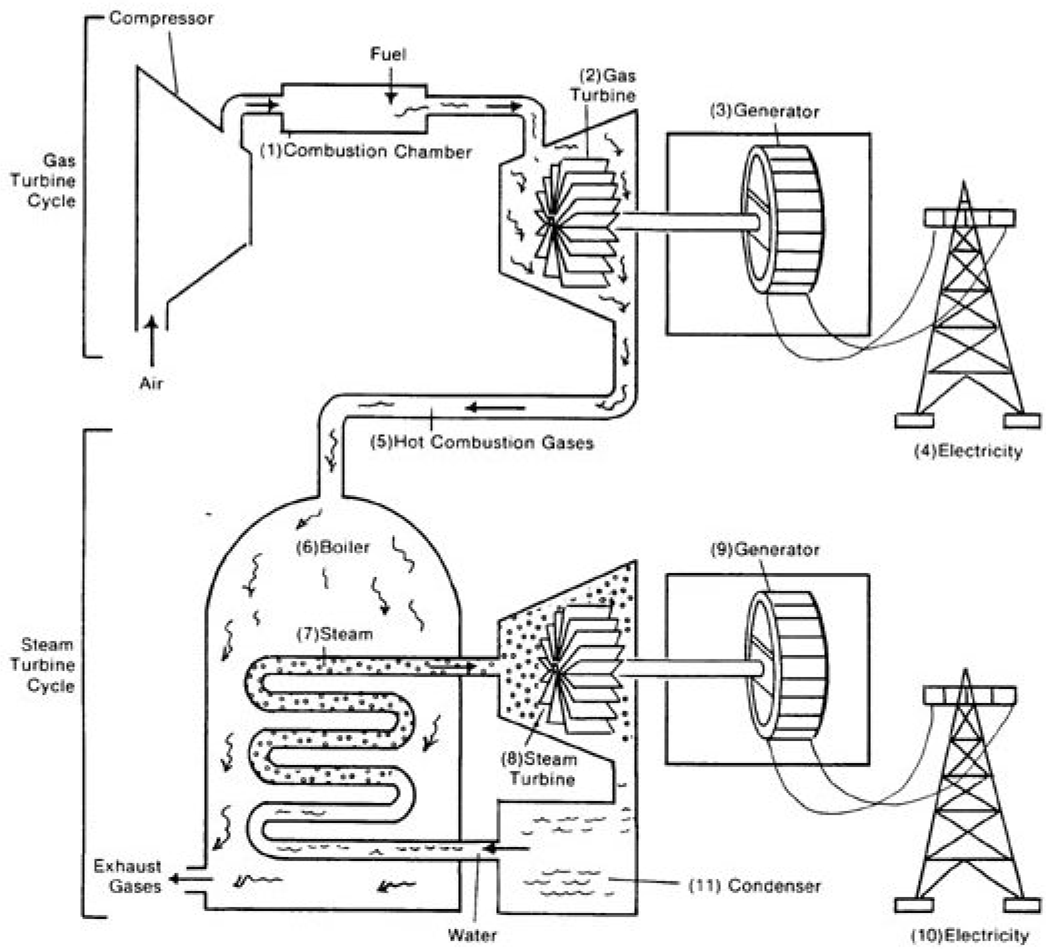


Figure 2-13. Major Elements of Natural Gas Combined Cycle System

period, virtually all new generation built in the region was in the form of combined or simple cycle gas turbines. Most new base load power plant facilities built in the United States in the past 10 years have used NGCC technology. NGCC plants have demonstrated high reliability and low maintenance costs.

Environmentally, as documented in the air emissions rates in Table 2-7, NGCC is clearly superior to other non-renewable energy resources. Assessing the entire life cycle, one of NGCC's drawbacks is the loss of potent greenhouse gas methane during extraction and

distribution (Spath and Mann, 2000). Even though air pollution concerns are much lower with gas-fired plants than oil or coal-fired plants, there are other environmental concerns, including water use and water pollution. Combined cycle plants use about 10 million gallons of water per day, consuming seven million and discharging three million gallons back into nearby water bodies (PF, 2005).

More recently, because of the increased supply burden placed on natural gas, its price is increasing significantly, which affects not only the price of electricity produced by gas-fired generation but also the cost to heat homes and businesses. Because of highly variable and volatile natural gas fuel costs, as well as the likelihood of significant future price rises as domestic production crests and demand continues to intensify, NGCC is not a reliable, cost-effective option to meet the long-term energy needs of the SME service area.

2.1.5.2 Microturbines

Microturbines are small combustion turbines, approximately the size of a refrigerator, with outputs of 25-500 kW. They evolved from automotive and truck turbochargers, auxiliary power units for airplanes, and small jet engines and are composed of a compressor, a combustor, a turbine, an alternator, a recuperator, and a generator. Microturbines offer a number of potential advantages over other technologies for small-scale power generation. These include their small number of moving parts, compact size, light weight, greater efficiency, lower emissions, lower electricity costs, and ability to use waste fuels. They can be located on sites with space limitations for the production of power, and waste heat recovery can be used to achieve efficiencies of more than 80 percent (DOE, 2005h).

Because of their compact size, relatively low capital costs, low operations and maintenance costs, and automatic electronic control, microturbines are expected to capture a significant share of the distributed generation market (DOE, 2005h). Types of applications include stand-alone primary power, backup/standby power, peak shaving and primary power (grid parallel), primary power with the grid as backup, resource recovery and cogeneration. Target customers include financial services, data processing, telecommunications, office buildings and other commercial sectors that may experience costly downtime when electric service is lost from the grid (SME, 2004a).

In general, microturbine power plants are not currently cost competitive with conventional power-generation technologies. The capital cost of a microturbine unit is approximately \$2,500/kW. The total levelized cost of microturbine power is projected to be approximately \$113/MWh. Typically, microturbine units become economical for remote locations, where grid power is not available, and when low cost waste fuel is available (SME, 2004a). The U.S. Department of Energy's Office of Power Technologies is currently leading a national effort to design, develop, test, and demonstrate a new generation of microturbine systems for distributed energy resource applications. The goal is to develop advanced microturbines that will be cleaner, more fuel efficient and fuel-flexible, more reliable and durable, and lower in cost than the first-generation products entering the market today (DOE, 2005f).

Currently, microturbine units alone cannot fulfill the need for 250 MW of long-term, cost-effective, and competitive generation of base load capacity for the SME service area. This

power generation technology pollutes more and costs more per unit of power generated than conventional power generation technologies; they are intended primarily for remote locations and as backup units rather than for base load supply.

2.1.5.3 Pulverized Coal

Modern pulverized coal plants generally vary widely in size from 80 MW to 1,300 MW and can use coal from various sources. Coal is most often delivered by unit train to the site, although barges or trucks are also used. Many plants are situated adjacent to the coal source where delivery can be by conveyor. Coal can have various characteristics with varying Btu heating values, sulfur content, and ash constituents. The source of coal and coal characteristics can have a significant effect on the plant design in terms of coal-handling facilities and types of pollution control equipment required.

Regardless of the source, the plant coal-handling system unloads and stacks out the coal, reclaims the coal as required, and crushes the coal for storage in silos. Then the coal is fed from the silos to the pulverizers and blown into the steam generator (Figure 2-14). The steam generator mixes the pulverized coal with air, which is combusted, and in the process produces heat to generate steam. Steam is conveyed to the steam turbine generator, which converts the steam thermal energy into mechanical energy. The turbine then drives the generator to produce electricity.

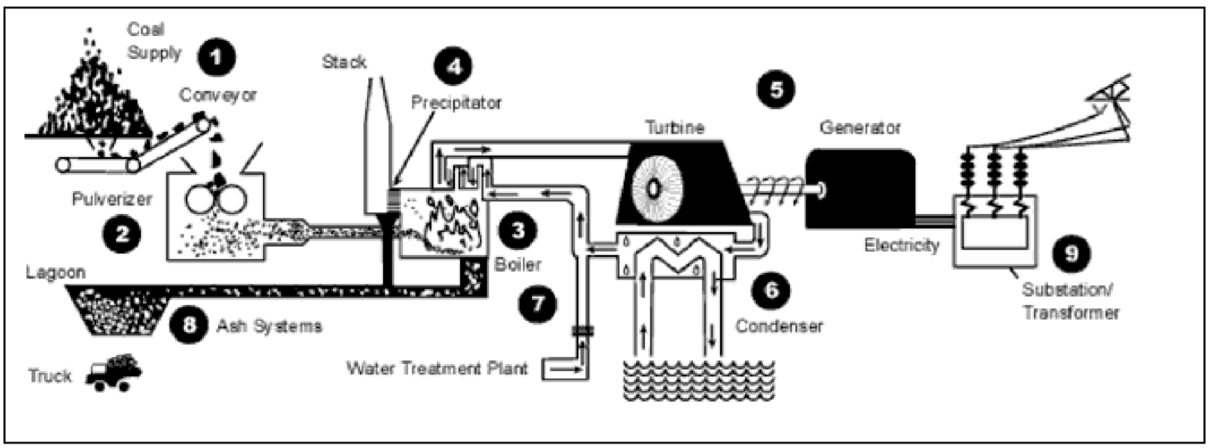


Figure 2-14. Diagram Depicting Components of a "Generic" Pulverized Coal Power Plant

Estimated air emissions for a 250 MW pulverized coal plant are documented in Table 2-7. Pollution control equipment would include either a fabric filter (bag house) or an electrostatic precipitator for particulate control (fly ash), selective catalytic reduction for removal of NOx, and a flue gas desulfurization system for removal of SO_2. Limestone is required as the reagent for the most common wet FGD process, limestone forced oxidation desulphurization. A limestone storage and handling system is a required design consideration with this system.

Pulverized coal plants represent the majority of coal-fired electric generating stations in the country, and coal-fired thermal plants generate more electricity than any other type in the United States. Because of the widespread use of PC plants, their air emissions are major contributors to

a wide array of significant and cumulative environmental problems, including acid rain, visibility reduction, mercury emission, deposition and accumulation, and global warming (Applied Geochemistry Group, 2001; Eilperin, 2004; EPRI, 1998; IPCC, 2004; Kenworthy, 2004; Malm, 1999; EPA, 2005a; EPA., 2005b; EPA, 2004a; EPA, 2004b; EPA, 2003a; EPA, 2003b; EPA, 2003c; EPA, 2003d; EPA, 2003e; EPA, 2003f; EPA, 2003g; EPA, 2003h; EPA, 2003i; EPA, 2003j; EPA, 2003k; EPA, 2002c; EPA, 2000c; EPA, 1998c; EPA, 1997; USGS, 2000a; Suplee, 2000).

Pulverized coal plants produce several forms of liquid and solid waste. Liquid wastes include cooling tower blowdown, coal pile runoff, chemicals associated with water treatment, ash-conveying water, and FGD wastewater. Solid wastes include bottom and fly ash and FGD solid wastes. Disposal of these wastes is a major factor in plant design and cost considerations.

PC plants, although having a high capital cost relative to some alternatives, have an advantage over other non-renewable combustible energy source technologies due to the relatively low and stable cost of coal. New conventional pulverized coal plants achieve above 40 percent efficiency. Advanced modern plants use specially developed high strength alloys, which enable the use of the supercritical and ultra-supercritical steam (high pressures and temperatures) necessary to achieve the higher cycle efficiencies and can achieve, depending on location, close to 45 percent efficiency (CURC, 2005).

Constructing and operating a PC plant typically requires numerous permits and approvals from federal and state regulatory agencies. A major source Prevention of Significant Deterioration (PSD) air construction permit may be required from DEQ. The permit application, agency review, and public comment process can be extensive for a new coal-fired resource.

A PC generating station would have the benefit of relatively low cost and high reliability for base load generation for SME. However, these advantages are offset by the somewhat greater emissions of PC plants than CFB plants (Table 2-7). Typical PC plants use more water and generate more solid waste than CFB plants. In addition, at this scale, the total busbar cost is about 25 percent higher for a PC than a CFB plant (Table 2-6), as a result of higher operating and maintenance expenses. For these reasons, this alternative is eliminated from more detailed consideration in this EIS.

Busbar Cost

The busbar cost is the wholesale cost to generate power at a plant. The busbar itself is a copper or aluminum bar or bars to which the external trans-mission lines connect. The busbar is located inside the switchyard at the power plant.

2.1.5.4 Integrated Gasification Combined Cycle Coal

IGCC Overview

IGCC is a power generation process that integrates a gasification system with a conventional combustion turbine combined cycle power block. Rather than burning coal (or other feedstock) directly, the gasification system breaks it down to its basic chemical constituents. Coal is exposed to hot steam and carefully controlled amounts of oxygen under high temperatures and pressures. Carbon molecules in the coal then rupture, initiating chemical reactions that produce a

synthetic gas or syngas consisting of carbon monoxide, hydrogen and other compounds (DOE, 2006a). This combustible syngas is then used to fuel a combustion turbine to generate electricity, and the exhaust heat from the combustion turbine is used to produce steam for a second generation cycle and provide steam to the gasification process (Rosenberg et al., 2005).

Minerals in the fuel such as rocks, dirt and other impurities separate and leave the bottom of the gasifier either as an inert glass-like slag or other marketable solid products. Only a small fraction of the mineral matter is blown out of the gasifier as fly ash and requires removal downstream. Sulfur impurities in the feedstock form hydrogen sulfide, from which sulfur can be easily extracted, typically as elemental sulfur or sulfuric acid, both of which are valuable byproducts. Nitrogen oxides, another potential pollutant, are not formed in the oxygen-deficient (reducing) environment of the gasifier. Instead, ammonia is created by nitrogen-hydrogen reactions; ammonia can be readily stripped out of the gas stream (DOE, 2006b).
.
The use of these two types of turbines in combination – a combustion turbine and a steam turbine – known as a "combined cycle," is one reason why gasification-based power systems can achieve unprecedented power generation efficiencies (refer to Figure 2-15). Currently, gasification-based systems can operate at around 45 percent efficiencies; in the future, these systems may be able to achieve efficiencies approaching 60 percent. In contrast, a conventional coal-based boiler plant, employing only a steam turbine-generator, is typically limited to 33-40 percent efficiencies (DOE, 2006b).

Potential Environmental Benefits

IGCC is an emerging, advanced technology with great promise for generating electricity with coal that can substantially reduce some air emissions, water consumption, and solid waste production (if gasification byproducts can be sold) as compared to conventional coal-fired power plants (EPA, 2006g). IGCC offers the potential for using coal in electricity generation with improved environmental performance, particularly reduced air emissions, through gasification and removal of impurities prior to combustion in the combustion turbine. This emissions control method is very different from conventional coal-fired power plants, which achieve virtually all emissions control through combustion and post-combustion controls that treat exhaust gases. Because the syngas produced in the gasification process has a greater concentration of pollutants, lower mass flow rate, and higher pressure than stack exhaust gas, emissions control through syngas cleanup is generally more cost-effective than post-combustion treatment to achieve the same or greater emissions reductions (Rosenberg et al., 2005). Overall environmental impacts from emissions of an IGCC plant would be expected to range somewhere between those of a natural gas combined cycle plant and a pulverized coal plant (Table 2-7). In Table 2-7, air emissions from IGCC and CFB plants are similar (taking into account higher sulfur coal used in Polk Power tests) with the exception of particulate matter and CO emissions, which are lower for an IGCC plant. A recent EPA report (EPA, 2006g) cites the overall potential for a reduced environmental footprint of IGCC in comparison with conventional coal-fired technologies with regard to reduced emissions of criteria pollutants and mercury.

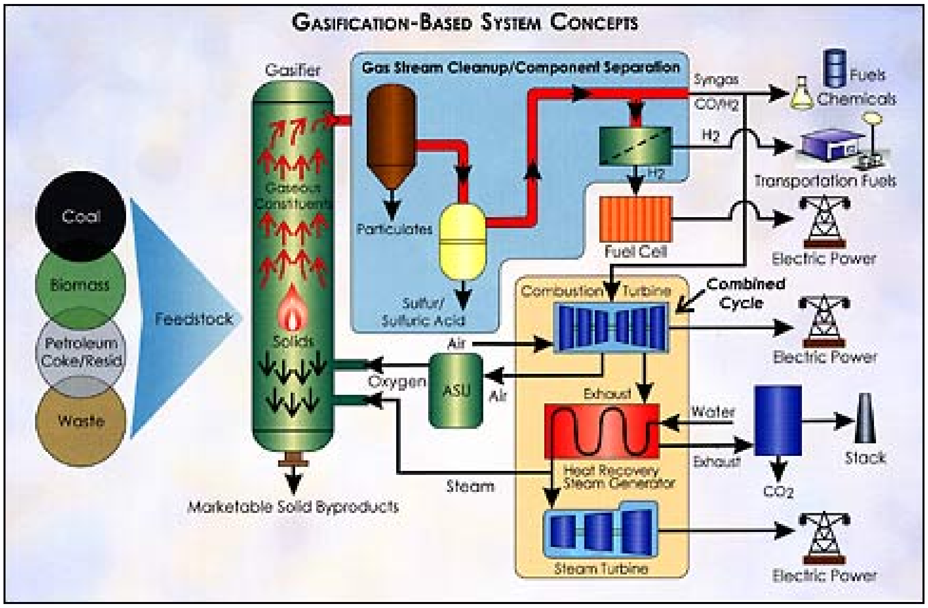


Figure 2-15. Gasification-based System Concepts (DOE, 2006b)

DOE also believes coal gasification may be one of the best ways to produce clean-burning hydrogen for automobiles and power-generating fuel cells. It might also offer greater potential for removing carbon dioxide at a lower cost for potential sequestration, thereby reducing emissions of this greenhouse gas (DOE, 2006b). However, no existing IGCC facility anywhere in the world removes or sequesters carbon dioxide.

DOE is currently spearheading "FutureGen," a $1 billion public-private partnership to build the world's first coal-fueled, "zero emissions" power production plant (FutureGen, 2006a). Partners in the "FutureGen Industrial Alliance" include seven American coal companies and utilities and one Chinese utility, coordinated by the non-profit Batelle research and industrial firm. A prototype, consisting of a 275-MW FutureGen plant, is slated to begin operations in 2013. It will produce electricity for about 150,000 homes using the IGCC process, as well as hydrogen and a concentrated stream of carbon dioxide. The hydrogen will be used as a clean fuel in applications such as electricity generation in turbines or fuel cells, or hybrid combinations of these technologies. Captured CO_2 will be separated from the hydrogen and permanently stored in deep saline formations, unmineable coal seams, depleted oil and gas formations, or other geologic formations. Ninety percent of the total carbon dioxide produced by the plant is expected to be captured initially, and with advanced technologies, this type of plant may eventually be able to capture up to 100 percent of carbon dioxide emissions (FutureGen, 2006a; DOE, 2006d).

Reliability and Cost

Although recognizing the potential benefits mentioned above, at the present time, the U.S. utility industry lacks extensive operating experience with IGCC technology. Each major component – gasification and combined cycle – of IGCC has been broadly used in industrial and power generation applications. However, the industry lacks experience at integrating these two

complex processes. The integration of coal gasification with a combined cycle power block to produce commercial electricity as a primary output has been demonstrated at only a handful of facilities around the world, including two in the United States (DOE, 2006c). As time goes on, the industry is gaining valuable experience, which has been and continues to be demonstrated at the Polk and Wabash stations over the last several years. This growing experience is leading to increased confidence within the industry that reliability problems encountered to date can be overcome eventually. As a result, a number of new commercial-scale plants have been proposed by large utilities in recent years, including several plants announced in Colorado, Texas, Illinois, Indiana, and Florida.

Excluding the cost of financing, the cost of designing and building a power plant for IGCC is estimated to be about 20 percent higher than for PC systems (Rosenberg et al., 2005). The combined cycle portion of the process is attractive from a capital cost perspective compared to a conventional coal plant, but the addition of gasification, coal feed equipment, gas cooling, gas cleanup, and the installation of an oxygen plant result in an overall cost that is higher than a conventional coal plant. The resulting higher efficiency as compared to a conventional coal plant cannot offset the higher capital costs. In 2004, the capital cost was about 30 percent higher and the efficiency approximately five percent better than a conventional coal plant. This cost and performance comparison does not result in a cost of electricity that is lower than a conventional coal plant (Dalton, 2004).

IGCC plants are very complex and are often down for repairs, resulting in a reliability factor of 80-85 percent in the two existing U.S. plants (Amick, 2006; Black, 2003), which is significantly lower than the reliability of a CFB plant (over 95 percent). During the period of down-time, it would be necessary for SME to procure power from the open market, resulting in higher energy costs as well as potentially increased air pollution, since the energy might be purchased from older, coal-fired plants with less efficient pollution controls. Thus, in addition to higher capital costs, the overall operating cost of an IGCC plant would be higher than that of a CFB plant and it could possibly lead to increased emissions during the periods of down-time, which would likely occur more frequently than for a CFB plant.

Investments to design and build commercial IGCC power plants on a large scale in the U.S. have been slow to materialize due to cost and risk concerns. A 2004 survey by DOE indicates that the three leading risk factors perceived by industry to be associated with IGCC investments are high capital costs, excessive down time, and difficulty with financing (Rosenberg et al., 2005). The U.S. Department of Energy is continuing to fund research and development of IGCC, focusing on improvements in efficiency, fuel flexibility, and economics (DOE, 2005j).

Conclusion

Because IGCC technology is currently more costly and requires further demonstration to achieve the industry standard of 90 percent reliability for baseload generation, an IGCC facility is not a reasonable alternative for meeting SME's projected energy needs. While acknowledging IGCC's potential environmental benefits, it cannot meet SME's near-term energy generation needs.

2.1.5.5 Oil

In the United States as a whole, electricity generated by oil or petroleum (including distillate fuel oil, residential fuel oil, petroleum coke, jet fuel, kerosene, other petroleum and waste oil) has declined substantially in recent decades. From a peak of 365 million MWh in 1978 (17 percent of total U.S. net electricity generation in that year), petroleum accounted for just 118 million MWh – three percent – of net electricity generated in 2004 (EIA, 2005f). With the peak of domestic petroleum production in 1970, rising imports since then, increasing global prices over the last few years and the prospect for more of the same, plus competition for this valuable fuel commodity not only from the transport sector but also from the petrochemical industry, it is virtually certain that the downward trend for using petroleum to generate electricity will continue.

Three technologies are used to generate electricity from oil:

- *Conventional steam* - Oil is burned to heat water and create steam to generate electricity;
- *Combustion turbine* - Oil is burned under pressure to produce hot exhaust gases which spin a turbine to generate electricity;
- *Combined-cycle technology* - Oil is first combusted in a combustion turbine, using the heated exhaust gases to generate electricity. After these exhaust gases are recovered, they heat water in a boiler, creating steam to drive a second turbine (this is the NGCC process described in Section 2.1.5.1) (PowerScorecard, 2005).

Oil, like coal, is a fossil fuel, and burning it emits most of the same air pollutants as burning coal, though in different quantities. Oil combustion for electricity generation produces air pollutants such as nitrogen oxides, volatile organic compounds, and particulates, as well as, depending on the sulfur content of the oil, sulfur dioxide. Generating electricity from oil also results in emissions of the greenhouse gases carbon dioxide and methane and heavy metals such as mercury (PowerScorecard, 2005).

The looming peak of global oil production – whether in the current or an upcoming decade – presents the United States and the entire world with an unprecedented challenge in risk management. As the peak is approached – at the same time that global demand for oil is still increasing steadily in developed countries like the U.S. but now also increasing sharply to fuel the industrial development of rapidly growing, heavily populated countries like China and India – liquid fuel prices and price volatility will increase dramatically. Without timely mitigation, the economic, social, and political costs could be unprecedented (Hirsch et al., 2005). Skyrocketing gas prices and price volatility are much on the minds of Americans consumers and motorists even today each time they pull up to a gasoline station.

Important observations and conclusions from a 2005 U.S. Department of Energy-funded study (Hirsch et al., 2005) on the implications of "peak oil" include:

1. When the peak of world oil production will occur is not known with certainty. A fundamental problem in predicting oil peaking is the poor quality of and possible political biases inherent in world oil reserves data. (In the 1980s many member states of the

Organization of Petroleum Exporting Countries (OPEC) cartel arbitrarily boosted their stated reserves in order to capture higher production quotas. These stated "political" reserves must be regarded with skepticism.) Some experts believe peaking may occur soon. The 2005 DOE study indicates that "soon" is within 20 years, while some authorities believe peaking may even occur before 2010.

2. The problems associated with world oil production peaking will not be temporary but rather, long-lived. Therefore, past "energy crisis" experiences, which were temporary (e.g., 1974-75 during the Arab Oil Embargo and 1979-80 due to the Iranian Revolution), will provide limited guidance. The challenge of peak oil deserves immediate, serious attention, if risks are to be fully understood and mitigation initiated on a timely basis.
3. Oil peaking will create a severe liquid fuels problem for the transportation sector, not an "energy crisis" in the usual sense that term has been used.
4. Peaking will result in dramatically higher oil prices, which will cause protracted economic hardship in the United States as well as the world. However, the problems are not insoluble. Timely, aggressive mitigation initiatives addressing both the supply and the demand sides of the issue will be required.
5. In the developed nations, the problems will be especially serious. In the developing, less affluent nations, peaking problems have the potential to be even worse.
6. While greater end-use efficiency in the use of oil is essential, increased efficiency alone will be neither sufficient nor timely enough to solve the problem. Production of large amounts of substitute liquid fuels will be required. Various commercial or near-commercial substitute fuel production technologies are currently available for deployment, so the production of vast amounts of substitute liquid fuels is feasible with existing technology.
7. Intervention by governments will be required, because the socioeconomic implications of peak oil and the post-peak oil period would otherwise be chaotic. The experiences of the 1970s and 1980s offer some guidance as to government actions that are desirable and those that are undesirable, but the process will not be easy (Hirsch et al., 2005).

In conclusion, no one has built or is contemplating building oil-fired plants in recent years because of their high and increasing operating cost and, as compared to natural gas, greater air emissions, thereby requiring additional air pollution controls. In terms of SME's need to generate affordable electricity for its members and customers, oil would not be a cost-effective alternative, and thus is not evaluated any further in this EIS.

2.1.6 NUCLEAR POWER

First commercialized in the late 1950's, nuclear power now accounts for approximately one-fifth of the total electricity generated in the United States. In a nuclear fission reactor, uranium atoms are fissioned or split, which generates considerable heat energy. The fission process for a uranium atom yields two smaller atoms of lighter elements, one to three free neutrons, plus a large amount of energy in the form of heat. This heat then boils water to make the steam that turns the turbine-generator, just as in a fossil fuel plant. The part of the plant where the heat is produced is called the reactor core (EIA, no date-a).

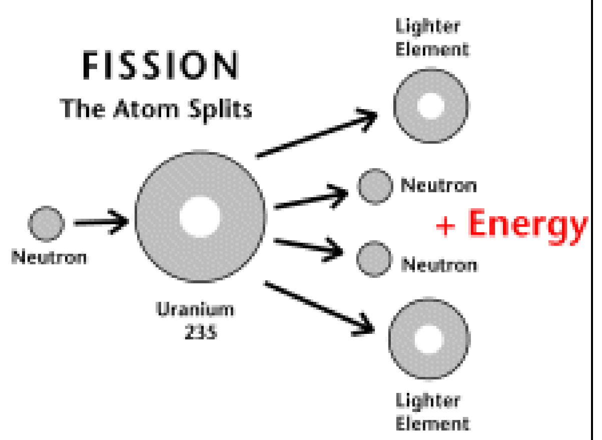


Figure 2-16. Nuclear Fission

"Free" neutrons means the neutrons are free of any atomic nuclei, in which neutrons are normally found closely bound with protons. Because more free neutrons are released from a uranium fission event than are required to initiate the event, the reaction can become self sustaining – a chain reaction – thus producing an enormous amount of energy (EIA, no date-b).

In the most of the world's nuclear power plants, so-called light-water reactors, fission heats ordinary water, or "light water," as opposed to "heavy water," which contains the heavy hydrogen isotope deuterium. The heated water is carried away from the reactor's core either as steam in boiling water reactors, or as superheated water in pressurized-water reactors. In either a boiling-water or pressurized-water facility, steam under high pressure is the medium used to transfer the nuclear reactor's heat energy to a turbine that mechanically turns an electric generator.

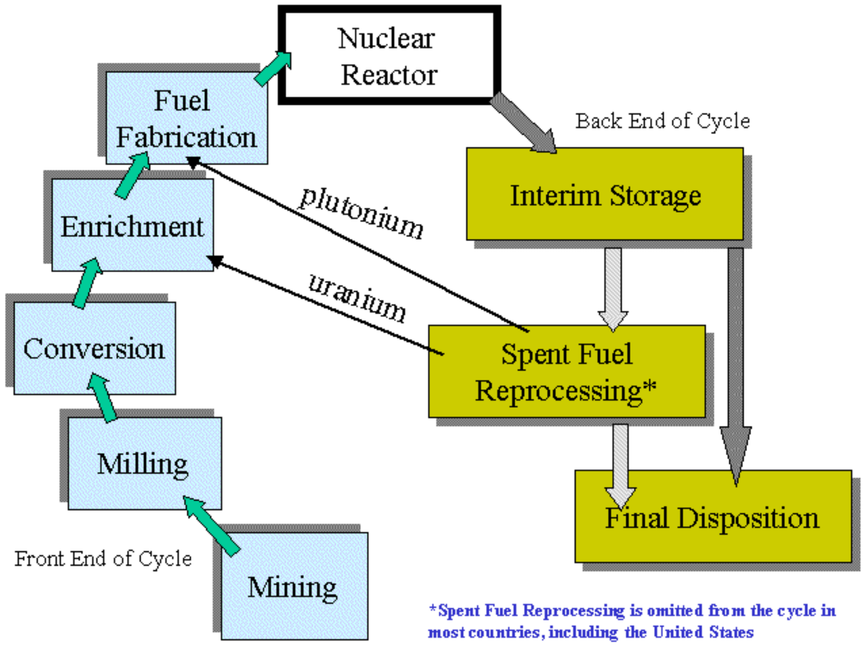
The fuel core for a light-water nuclear power reactor may contain up to 3,000 fuel assemblies. The fuel core is essentially a reservoir from which heat energy can be extracted through the nuclear chain reaction process. During the operation of the reactor, the concentration of U-235 (the reactive or fissile isotope of uranium) in the fuel declines as those atoms undergo nuclear fission. Some U-238 (the most common isotope of uranium in nature) atoms are converted to atoms of a plutonium isotope – fissile Pu-239 – some of which also undergo fission and produce energy. The products created by the nuclear fission reactions are retained within the fuel pellets and these become neutron-absorbing products (called "poisons") that act to slow the rate of nuclear fission and heat production. As the reactor operation is continued, a point is reached at which the decreasing concentration of fissile nuclei in the fuel and the increasing concentration of poisons result in lower than optimal heat energy generation, and the reactor must be shut down temporarily and refueled (EIA, no date-b).

The nuclear fuel cycle is illustrated in Figure 2-17. This complex cycle consists of "front end" and "back end" steps. The former lead to the preparation of uranium for use as fuel in reactor operation while the latter are necessary to safely manage and dispose of the highly radioactive spent nuclear fuel. It is technically feasible to chemically process the spent fuel material to recover the remaining fractions of fissionable products, U-235 and Pu-239, for use in fresh fuel assemblies. However, reprocessing of spent commercial-reactor nuclear fuel is not permitted in the United States at this time (EIA, no date-b).

The front end of the nuclear fuel cycle starts with exploration and mining. Using geophysical techniques, geologists discover, evaluate and sample a deposit of uranium to determine the amounts that are extractable at specified costs. Uranium reserves are the amounts of ore that are estimated to be recoverable at stated costs (EIA, no date-b).

Uranium ore can be mined in either open pits or underground, or by using *in situ* leach mining, in which uranium is leached from the in-place ore. Uranium ores in the United States range from about 0.05 to 0.3 percent uranium oxide (U_3O_8). Certain uranium deposits developed in other countries are of higher grade and are also larger than deposits mined in the United States.

Figure 2-17. Nuclear Fuel Cycle



Mined uranium ores are normally milled by grinding the ore to a uniform particle size and then treating it to extract the uranium by chemical leaching. Milling typically yields a dry powder called "yellowcake," which is high-concentration U_3O_8. U_3O_8 must be converted to uranium hexafluoride, UF_6, which is the form required by most commercial uranium enrichment facilities. UF_6 is a solid at room temperature but can be changed to a gas at moderately higher temperatures. The UF_6 conversion product contains only natural, not enriched, uranium.

The concentration of the fissionable or fissile uranium isotope, U-235 (only 0.71 percent in natural uranium) is less than that required to sustain a nuclear chain reaction in light-water reactor cores. Thus, natural UF_6 must be "enriched" by increasing the concentration of U-235 to about four percent. Gaseous diffusion and gas centrifuge are the commonly used uranium enrichment technologies. The gaseous diffusion process consists of passing the natural UF_6 gas feed under high pressure through a series of diffusion barriers (semiporous membranes) that permit passage of the lighter U-235F_6 atoms at a faster rate than the heavier U-238F_6 atoms. Because this technology requires a large capital outlay for facilities and it consumes large amounts of electrical energy, it is relatively cost intensive. In the gas centrifuge process, the natural UF_6 gas is spun at high speed in a series of cylinders. This acts to separate the U-235F6 and U-238F6 atoms based on their slightly different atomic masses. Gas centrifuge technology involves relatively high capital costs for the specialized equipment required, but its power costs

are less than those for the gaseous diffusion technology. New enrichment technologies currently under development include the atomic vapor laser isotope separation and the molecular laser isotope separation (EIA, no date-b).

For use as nuclear fuel, enriched UF_6 is converted into uranium dioxide (UO_2) powder which is then processed into pellet form. The pellets are stacked, according to each nuclear core's design specifications, into tubes of corrosion-resistant metal alloy. The tubes, called fuel rods, are sealed to contain the fuel pellets. The finished fuel rods are grouped in special fuel assemblies that are then used to build up the nuclear fuel core of a power reactor.

The first step of the back end of the nuclear fuel cycle is interim storage. After its operating cycle, the reactor is shut down for refueling. Its spent fuel is stored either at the reactor site or, potentially, in a common facility away from reactor sites. If on-site pool storage capacity is exceeded, it may be desirable to store aged fuel in modular dry storage facilities known as Independent Spent Fuel Storage Installations (ISFSI) at the reactor site or at a facility away from the site. The spent fuel rods are usually stored in water, which provides both cooling (the spent fuel continues to generate heat as a result of residual radioactive decay) and shielding (to protect the environment from residual ionizing radiation) (EIA, no date-b).

Spent fuel discharged from light-water reactors contains fissile U-235 and Pu-239, as well as “fertile” U-238 and other radioactive materials. These fissile and fertile materials can be chemically separated and recovered, and then, if economic and institutional conditions permit, recycled for use as nuclear fuel. Currently, plants in Europe are reprocessing spent fuel from utilities in Europe and Japan. At this time, however, such recycling is not carried out in the United States.

The final step in the nuclear fuel cycle is final disposition of radioactive nuclear wastes. The safe disposal and isolation of either spent fuel from reactors or, if the reprocessing option is used, wastes from reprocessing plants, is a major concern in the nuclear field and with the public. These waste products must be isolated from the biosphere until the radioactivity contained in them has diminished to a safe level. Under the Nuclear Waste Policy Act of 1982, as amended, the Department of Energy has responsibility for developing a permanent waste disposal system for spent nuclear fuel and high-level radioactive waste. Current plans call for the ultimate disposal of the wastes in solid form in licensed deep, stable geologic structures (EIA, no date-b). DOE has been studying Yucca Mountain in Nevada for this purpose.

Environmental concerns about nuclear power arise from several phases of the nuclear fuel cycle, especially mining, reactor safety, and interim and permanent waste disposal. Uranium mining has been cited by some scientists and activists as an occupational health hazard to miners, while improper disposal of tailings is alleged to have left active and former mine sites with an enduring source of radioactive contamination. The public’s faith in the operational safety of nuclear power reactors was badly shaken by a partial core meltdown during the 1979 accident at Three Mile Island in Pennsylvania and a 1986 full core meltdown at Chernobyl in the former Soviet Union. In addition, the possibility of terrorist attacks on nuclear power plants and proliferation issues – especially the potential for fissile or radioactive materials falling into the hands of terrorists – have also fueled rising public anxiety. A 2003 study by the Massachusetts Institute

of Technology concluded that the current international safeguards regime is inadequate to meet security challenges (MIT, 2003). Finally, both the interim and final disposal of nuclear wastes have become highly contentious and politicized as a result of doubts about the ability of the methods being used and proposed to ensure public safety and environmental protection.

These continuing concerns, as well as delays and cost overruns in constructing nuclear power plants, led to the cancellation of every plant ordered in the U.S. after 1974; no plants have been ordered since 1977. In recent years however, many Americans have expressed renewed interest in nuclear power as a result of concerns about fossil fuel depletion and global climate change (MIT, 2003). As fossil fuels, especially natural gas, have become costlier, the operating cost of nuclear power has held relatively constant. Among major U.S. investor-owned electric utilities, the average total operating expenses for fossil steam power plants increased from 21.8 to 27.7 mills per kilowatt-hour between 1994 and 2005; over the same period, the total operating expenses for nuclear power declined from 20.9 to 18.2 mills per kilowatt-hour (EIA, 2006a). In addition, newer reactor designs emphasize operational safety features.

There are currently 104 commercial nuclear generating units fully licensed by the U.S. Nuclear Regulatory Commission (NRC) to operate in the United States. Of these 104 reactors, 69 are pressurized water reactors totaling 65,100 net megawatts while 35 units are boiling water reactors totaling 32,300 net megawatts. Although the United States has more nuclear capacity than any other nation, no new commercial reactor has come on line since May 1996. The current administration has been supportive of nuclear energy, emphasizing its importance in maintaining a diverse energy supply. Nevertheless, as of October 31, 2006, no U.S. company had yet applied for a new construction permit (EIA, 2006b). In the meantime, older reactors that are nearing the end of their operating permits and lifetimes have begun to be decommissioned and shut down. In some cases, issuance of new operating permits has necessitated the installation of upgrades to systems, equipment and materials for the existing facilities.

SME did not actively pursue nuclear as an energy source for several reasons. Permitting and construction of nuclear power plants takes considerably longer than for PC or CFB plants. Given SME's urgent need to bring a new base load generating source on line as soon as possible, or face serious financial consequences, this is a distinct disadvantage. Furthermore, even with renewed emphasis on nuclear power as a component of a national energy strategy, building a new nuclear power plant would still face the daunting prospect of stiff public opposition and permitting uncertainty. Furthermore, nuclear power plants are built on a large scale that far exceeds SME's 250 MW need, so nuclear power would therefore not be an appropriate or cost-effective technology at this size.

2.1.7 COMBINATIONS OF ENERGY SOURCES

In response to concerns expressed by the public in commenting on the DEIS, the agencies have added two alternatives, each consisting of combinations of energy sources considered independently in this chapter. Section 2.1.2 on energy conservation and efficiency indicated that load reductions on the order of 10 percent could reasonably be achieved through a concerted effort on this front. Thus, the combinations below each assume a 10 percent contribution from conservation and efficiency.

As discussed in Section 2.1.3.4, geothermal energy is not considered to be a viable commercial generation source in Montana, and is therefore excluded from the discussions below. Use of geothermal energy in a dispersed fashion, such as with ground source heat pumps, is considered as part of conservation and efficiency efforts. Biomass, biogas and municipal solid waste energy resources in the state, as discussed in Sections 2.1.4.1, 2.1.4.2 and 2.1.4.3, are too scarce to make an appreciable contribution to the energy mix, and are therefore excluded. Hydro-electricity, wind, and solar energy have more potential in Montana than these.

2.1.7.1 Combination of CFB and Renewable Energy Sources

This alternative consists of a 150-MW CFB coal-fired power plant in conjunction with a combination of conservation, efficiency improvements, and renewable energy sources. The renewable energy sources would be comprised of a variable and flexible mix of wind, solar, and hydroelectricity. Conservation, efficiency, and renewable sources would therefore have to meet a net 100 MW of capacity. Assuming that conservation and efficiency are able to meet 10 MW (10 percent) of this 100 MW, renewable sources would have to supply the remaining 90 MW. Of the three renewable sources, hydroelectricity has the greatest ability to regulate output, thus meeting dispatchable capacity requirements. In contrast, solar and wind are inherently limited in this respect, due to their intermittency and relative unpredictability, and there is no ability to regulate their output as needed.

Thus, under this combination alternative, two variations have been developed. In the first, wind and solar are assumed to supply the greater share of the needed 90 MW. In the second variant, hydroelectricity is assumed to supply the greater share, with wind and solar making up the difference.

As noted above, each of the variants below would still have a 150-MW CFB facility. The footprint of a facility this size would still be approximately 160 acres, about the size of the full-scale 250-MW HGS, because of diseconomies of scale (that is, a smaller output facility would still need all of the same infrastructure as the larger facility). The sizes of project components such as the stack, raw water line, potable water line, wastewater line, transmission lines, railroad spur, and transportation improvements would not change with the 150-MW CFB plant. Other components such as the ash disposal area within the overall footprint would be proportionately downsized.

Certain direct impacts of the 150-MW facility would be proportionately smaller (by about 40 percent) than the 250-MW HGS, such as air emissions, consumptive water use, coal consumption, wastewater generation, and fly and bed ash generation. In terms of air emissions, overall criteria pollutant, mercury, and carbon dioxide emissions would all be approximately 40 percent less than the HGS. Economic benefits to Great Falls and Cascade County would be somewhat or slightly less. Although some of the facilities that comprise the generating station itself would be somewhat smaller, overall the visual presence and noise signature, and therefore, impacts on visual resources, cultural resources, and the acoustic environment – namely on the Great Falls Portage National Historic Landmark – would be only marginally smaller, and still significant. The number of unit coal trains servicing the plant would likely not be reduced, but the number of coal cars in each train would be smaller.

Wind and Solar Dominant

In this variant, wind would supply 40-60 MW and solar 15-25 MW, leaving 5-35 MW for hydroelectricity. Using the land area requirements described in Sections 2.1.3.1, 2.1.3.2 and 2.1.3.3, first order approximations of the land required for each of these renewable contributions can be derived. To produce 40-60 MW of wind capacity, assuming 13.47 MW/sq. mi. for a Class 4 wind resource area, approximately 3-4.5 square miles (1,920-2,880 acres) of terrain would be used. If large 1.5-MW turbines were used to supply this electricity, that would represent about 25-40 approximately 400-ft. high wind turbines. To supply 15-25 MW of power with solar energy using photovoltaic systems would require up to 31 acres. To supply 5-35 MW of hydroelectricity would require a facility roughly the size of one of the dams and generation facilities along the Great Falls of the Missouri River.

Wind energy on the scale assumed in this variant could entail certain environmental impacts of the sort described in Section 2.1.3.1. Given the presence of the 150-MW CFB plant at the Salem site, for reasons of reducing additional costs associated with additional transmission lines and other infrastructure development, wind development would preferably be located at or near the Salem site. Therefore, the placement of some 25-40, 1.5-MW wind turbines in the vicinity of the Salem site, close to or within the Great Falls Portage NHL, would result in significant visual and cultural resource impacts. Because the area is not a site with concentrated bird populations (e.g. wetland or river) or a known migratory route, impacts on bird mortality from a wind farm of this size would not likely be significant, but this would still require additional study and monitoring. Wind turbine operation does not generate emissions, consume water, or generate solid wastes or waste water.

Developing 31 acres of land for solar power would necessitate purchasing this area for solar collectors or photovoltaic arrays, as well as facilities and infrastructure (e.g. buildings, generator, transformers, roads). Unlike with wind, this acreage would be entirely and permanently transformed; any prior use, for example as farmland, pasture, or wildlife habitat, would be eliminated. Although this acreage is not large in the context of a big state like Montana with ample open space, it could still potentially represent a significant adverse impact. There would be impacts to soils, hydrology, landform, vegetation, habitat, wildlife populations, and visual resources. Socioeconomic impacts, as with most job-creating development, would be somewhat positive, as would other environmental impacts, especially the potential elimination of criteria and hazardous pollutants and greenhouse gases. Water consumption associated with solar generation would be virtually nil. In addition, waste generation (wastewater and solid waste) would be virtually non-existent.

The proximity of these wind and solar facilities to the HGS transmission interconnection lines is an important issue and constraint. Electricity generated by these facilities would have to tie in with the interconnection lines before they reach Northwest Energy's system. If they could not, then the wind and solar components would lose their place in the queue and not be able to tie in with any certainty, without a delay and the possible necessity of constructing additional transmission capacity.

With regard to hydroelectricity, the assumed 5-35 MW would come from either existing, upgraded, or new facilities. If an existing or upgraded source of hydroelectricity could be found, this would clearly be preferable, because it would avoid new environmental impacts. However, competition for existing hydroelectric capacity is increasing, as evidenced by the impending loss of 80 percent of SME's supply from BPA, most of which was hydroelectricity. Moreover, constraints on the fixed hydroelectric resource in the Pacific Northwest and greater demands by the public for competing uses of river flows (e.g., for conserving and restoring salmon runs) are likely to further limit hydropower output. Thus the likelihood is low of obtaining existing hydroelectricity or developing new source(s) to meet the stated 5-35 MW.

If a new hydroelectric source could be found and developed, it would not be in the vicinity of the HGS because of a lack of nearby potential and there would be numerous problems to overcome. Permitting a new hydroelectric facility through the Federal Energy Regulatory Commission requires considerable time and includes the preparation of an EIS. Once permitted, construction of a new facility could take years to complete; the actual time would depend on the location. Transmission lines would have to be installed to two substations and the interconnections would have to be placed in the queue. If the transmission lines were of sufficient length, they would trigger the permitting requirements of the Montana Major Facility Siting Act, which also requires an EIS. Therefore, even if it were possible to build a new hydroelectric facility, it could be a decade before it was online providing the power that SME needs starting in 2008.

Construction of a new hydroelectric facility would impact a number of resources. A run of the river dam would cause fewer impacts but they would still likely be major and potentially significant to some resources. Depending on the size of the stream or river, one dam may or may not be sufficient to provide the entire amount of electricity. The impacts would be greater if more than one dam was needed. A dam which impounded water behind it would create even greater impacts as the stream and land behind the dam were covered by rising water. Dam construction and operation would impact hydrology, river dynamics, sediment transport, vegetation, soils, wildlife, wildlife habitat, fisheries, and possibly agriculture, land use, recreation, residential relocations, and roads. Socioeconomic benefits would include increased employment during construction and long-term employment during operation of the facility. There is potential for recreational benefits such as fishing, boating, and swimming and lakeshore development depending on the type of dam constructed. Flood control may also be a benefit.

Hydroelectric dam operation does not generate emissions, consume water, or generate solid wastes or waste water.

Hydroelectricity Dominant

In this variant, hydroelectricity would supply 50-60 MW and wind 15-25 MW, leaving 5-15 MW for solar. To supply 50 to 60 MW of hydroelectricity would require three to four smaller facilities about the size of the Black Eagle Dam or one larger facility roughly the size of Cochrane Dam on the Great Falls of the Missouri River. Using the land area requirements described in Sections 2.1.3.1 and 2.1.3.2, first order approximations of the land required for wind and solar can be derived. To produce 15-25 MW of wind capacity, assuming 13.47 MW/sq. mi. for a Class 4 wind resource area, approximately 1.1-1.9 square miles (704-1,216 acres) of terrain

would be used. If large 1.5-MW turbines were used to supply this electricity, that would represent about 10-17 approximately 400-ft. high wind turbines. To supply 5-15 MW of power with solar energy using photovoltaic systems would require up to 19 acres.

The supply of 50 to 60 MW of hydroelectricity would come from either existing, upgraded, or new facilities. The acquisition of existing or upgraded facilities or the purchase of power from those facilities would be the same as described for the Wind and Solar Dominant variant. Construction of new hydroelectric facilities would be on a larger scale than previously described. This variant would require three to four smaller facilities about the size of the Black Eagle Dam or one larger facility roughly the size of Cochrane Dam on a river the size of the Missouri River or more smaller dams on smaller streams. The problems discussed under the previous variant would be magnified under this variant for hydroelectricity. These problems include not only getting one or more facilities permitted but the associated impacts on environmental resources.

Wind energy on the scale assumed in this variant – 10-17, 1.5-MW wind turbines – could entail certain environmental impacts of the sort described in Section 2.1.3.1 and in the Wind and Solar Dominant variant above. Wind development would preferably be located at or near the Salem site. Therefore, the placement of even a reduced number of wind turbines in the vicinity of the Salem site, close to or within the Great Falls Portage NHL, would still result in significant visual and cultural resource impacts.

Developing 19 acres of land for solar power would necessitate purchasing this area for solar collectors or photovoltaic arrays, as well as facilities and infrastructure (e.g. buildings, generator, transformers, roads). The impacts and benefits would be proportionately smaller than those described for the variant above.

As in the previous variant, the proximity of these wind and solar facilities to the HGS transmission interconnection lines is an important issue and constraint.

Conclusion

Overall, both variants of this combination alternative would be somewhat superior to the Proposed Action because of proportionately smaller air emissions, water consumption and waste generation. An additional benefit of this alternative is that over the long term, it would be more sustainable, although not entirely sustainable due to the continued consumption of coal and release of greenhouse gases. However, this alternative would expand the overall footprint (land used) from that of the Proposed Action. In addition, the use of renewable sources would produce some adverse impacts on land, hydrology, wildlife, fisheries, visual and cultural resources, among others. These impacts would probably be somewhat more dispersed and widespread than in the case of the Proposed Action. There is particular potential for significant impacts to some resources, especially cultural and visual resources and the acoustic environment, due to the proximity of the Great Falls Portage NHL. Cultural and visual impacts of this combination alternative would likely exceed those of the Proposed Action, if the wind turbines and solar facilities were constructed in close proximity to the HGS, and hence the NHL. If these facilities were constructed further away from the NHL, this impact would be reduced or eliminated. However, doing so could impede the ability to connect these generation facilities with the grid.

Several factors affect this alternative's ability to meet the purpose and need for the proposed action. Assuming that wind and solar power could be developed and brought on line more quickly than the CFB plant, these resources could help fill the power deficit that will begin to emerge in 2008, when BPA supply begins to phase out. Because wind and solar are not dispatchable power (always able to meet demand as it occurs), firming power would have to be acquired during this time, at a cost to SME.

When the 150-MW CFB was completed and brought on line, SME's ability to meet its load would improve. However, once BPA sales were entirely phased out, and SME was faced with meeting all of its projected deficit with this alternative, SME would again be faced with the substantial expense of acquiring and maintaining firming power, for the times when either its wind or solar plants were idle or generating below capacity. The example shown in Table 2-13 of the EIS, assumes a 36 percent capacity factor (that is, wind is available about one-third of the time); the firming cost of wind in this example almost doubles its cost to the utility. The actual cost of the purchased power depends on the market at the time, but almost certainly would result in a higher or substantially higher cost than self-generation. The same general situation – the need to purchase expensive firming power – applies with solar power.

Hydroelectricity presents even greater risk and uncertainty at the present time. If new hydroelectricity could be obtained, the lengthy approval process and construction time would mean power would not be available until after the date it was needed by SME to replace lost power. If existing or new hydropower could be obtained, this energy source could reliably provide dispatchable power at either level assumed in these two variants. There would be no need to obtain firming power for a hydroelectric source. However, as discussed above, in the current environment, the probability of being able to obtain existing or new sources of hydropower must be considered low as the magnitude and extent of demand on water resources continues to grow. Thus, it would not be prudent to count on the assumed contribution of hydropower in this combination alternative.

Therefore, this combination alternative only partially meets the purpose and need of this project in the short-term. It does not provide reliable, cost effective, and consistent energy generation for the predicted long-term load.

2.1.7.2 Combination of Renewable Energy Sources

This alternative consists of a combination of conservation, efficiency improvements, and a variable and flexible mix of wind, solar, and hydroelectricity. Conservation, efficiency, and renewable sources would therefore have to meet the entire 250 MW of capacity. Assuming that conservation and efficiency are able to meet 25 MW (10 percent) of this 250 MW, renewable sources would have to supply the remaining 225 MW.

Under this combination alternative, two variations have been developed. In the first, wind and solar are assumed to supply the greater share of the needed 225 MW. In the second, hydroelectricity is assumed to supply the greater share, with wind and solar making up the difference.

Wind and Solar Dominant

In this variant, wind would supply 80-120 MW and solar 25-45 MW, leaving 80-100 MW for hydroelectricity. Using the land area requirements described in Sections 2.1.3.1 and 2.1.3.2, first order approximations of the land required for wind and solar facilities can be derived. To produce 80-120 MW of wind capacity, assuming 13.47 MW/sq. mi. for a Class 4 wind resource area, approximately 6-9 square miles (3,840-5,760 acres) of terrain would be used. If 1.5-MW turbines were used to supply this electricity, that would represent about 54-80 approximately 400-ft. high wind turbines. To supply 15-25 MW of power with solar energy using photovoltaic systems would require up to 56 acres. To supply 80-100 MW of hydroelectricity would require a facility roughly the twice the size of the Cochran Dam, the largest of the dams along the Great Falls of the Missouri River.

Wind energy on the scale assumed in this variant – 54-80, 1.5-MW wind turbines – could entail certain environmental impacts of the sort described in Section 2.1.3.1 and in the Wind and Solar Dominant variant in Section 2.1.7.1 above. Wind development could potentially be located at a number of locations within SME's service area. A site selection study would have to be done to identify locations that best met wind resource facility requirements.

Developing 56 acres of land for solar power would necessitate purchasing this area for solar collectors or photovoltaic arrays, as well as facilities and infrastructure (e.g. buildings, generator, transformers, roads). The impacts and benefits would be proportionately larger than those described for the variants above in Section 2.1.7.1.

An important factor for both wind and solar facilities would be the proximity of and ability to connect to grid transmission facilities. Depending on the location of firming facilities, these could also require additional transmission infrastructure. Because there would be no requirement to locate the wind farm or the solar facilities at or near the Salem site, there would be no impact to the Great Falls Portage NHL.

The supply of 80 to 100 MW of hydroelectricity would come from either existing, upgraded, or new facilities. The acquisition of existing or upgraded facilities or the purchase of power from those facilities would be the same as described for the Wind and Solar Dominant variant in Section 2.1.7.1 above. Construction of new hydroelectric facilities would be on a much larger scale than previously described. This variant would require one larger facility roughly twice the size of Cochrane Dam on a river the size of the Missouri River or several smaller dams on smaller streams. The problems discussed under the previous variants in Section 2.1.7.1 would be magnified under this variant for hydroelectricity. These problems include not only getting one or more facilities permitted but the associated impacts on environmental resources.

Hydroelectricity Dominant

In this variant, hydroelectricity would supply 80-120 MW and wind 80-100 MW, leaving 30-50 MW for solar. To supply 80-120 MW of hydroelectricity would require a facility about 2.5 times the size of the Cochrane Dam on the Great Falls of the Missouri River. Using the land area requirements described in Sections 2.1.3.1 and 2.1.3.2, first order approximations of the land

required for wind and solar can be derived. To produce 80-100 MW of wind capacity, assuming 13.47 MW/sq. mi. for a Class 4 wind resource area, approximately 6-7.4 square miles (3,840-4,736 acres) of terrain would be used. If 1.5-MW turbines were used to supply this electricity, that would represent about 54-67 approximately 400-ft. high wind turbines. To supply 30-50 MW of power with solar energy using photovoltaic systems would require up to 62 acres.

The supply of 80 to 120 MW of hydroelectricity would come from either existing, upgraded, or new facilities. The acquisition of existing or upgraded facilities or the purchase of power from those facilities would be the same as described for the Wind and Solar Dominant variant in Section 2.1.7.1 above. Construction of new hydroelectric facilities would be on a much larger scale than previously described.   This variant would require one larger facility roughly 2.5 times the size of Cochrane Dam on a river the size of the Missouri River or several smaller dams on smaller streams. The problems discussed under the previous variant would be magnified under this variant for hydroelectricity. These problems include not only getting one or more facilities permitted but the associated impacts on environmental resources.

Wind energy on the scale assumed in this variant—54-67, 1.5-MW wind turbines – could entail certain environmental impacts of the sort described in Section 2.1.3.1 and in Section 2.1.7.1 above. Wind development could potentially be located at a number of locations within SME's service area. A site selection study and a new transmission system impact study would have to be done to identify locations that best met wind resource facility requirements.

Developing 62 acres of land for solar power would necessitate purchasing this area for solar collectors or photovoltaic arrays, as well as facilities and infrastructure (e.g. buildings, generator, transformers, roads). The impacts and benefits would be proportionately larger than those described for the variants above in Section 2.1.7.1.   As with the wind system, a site selection study and a new transmission system impact study would have to be done to identify locations that best met wind resource facility requirements.

An important factor for both wind and solar facilities would be the proximity to and ability to transmit the capacity on the grid. Because there would be no requirement to locate the wind farm or the solar facilities at or near the Salem site, there would be no impact to the Great Falls Portage NHL.

Conclusion

Overall, with regard to environmental impacts, both variants of this combination alternative would be superior to the Proposed Action because of the elimination of air emissions, water consumption and waste generation other than minor air quality impacts during construction and storm water impacts. An additional benefit of this alternative is that over the long term, it would be more sustainable, in that it would eliminate the release of greenhouse gases.   However, this alternative would substantially expand the overall footprint (land used) from that of the Proposed Action. In addition, the use of renewable sources would produce some adverse impacts on land, hydrology, wildlife, fisheries, visual and cultural resources, among other resources. These impacts would probably be somewhat more dispersed and widespread than in the case of the Proposed Action. Impacts to the Great Falls Portage NHL would be avoided.

Several factors, including timing, affect this alternative's ability to meet the long term purpose and need of the proposed action is doubtful. The various studies required to locate the wind and solar facilities would most likely take about one year. Assuming that none of the interconnection transmission lines triggered MFSA, some of the wind and solar power could be developed and brought on line in time to help fill the power deficit that will begin to emerge in 2008, when BPA supply begins to be phased out. The remaining turbines and solar units would continue to be installed and brought on line as quickly as possible. Because wind and solar are not dispatchable power (always able to meet demand as it occurs), firming power would have to be acquired during this time, at a cost to SME, which may engender additional transmission requirements.

Hydroelectricity presents an even greater risk and uncertainty at the present time. If new hydroelectricity could be obtained, the lengthy approval process and construction time would mean power would not be available until after the date it was needed by SME to replace lost power. If existing or new hydropower could be obtained, this energy source could reliably provide dispatchable power at either level assumed in these two variants. There would be no need to obtain firming power for a hydroelectric source. However, as discussed above, in the current environment, the probability of being able to obtain existing or new sources of hydropower must be considered low. Thus, it would not be prudent to count on the assumed contribution of hydropower in this combination alternative.

This combination alternative does not meet the purpose and need of this project. It does not provide long-term term reliable, cost effective, and consistent energy generation for the predicted load.

2.1.8 OTHER COAL-FIRED POWER PLANT SITES

The Alternative Evaluation Study recommended CFB technology as the preferred generation method for meeting SME's identified need of 250 MW (SME, 2004a). With the selection of this technology and scale, SME then began to look for a suitable location for the proposed generating station. Early in 2004, Stanley Consultants, Inc. initiated a site screening study (SME, 2004d) focusing on the major factors that affect siting a 250-MW CFB power plant, including:

- Environmentally compliant
- Cost-effective
- High level of reliability
- Fuel cost stability
- Deliverability (The new generation source must be connected to the transmission system in a way to ensure delivery of power to the members which Southern Montana Electric serves.)
- Close proximity to Southern Montana Electric territory
- Operational availability by 2009
- Cooling water system must minimize impacts to the environment
- Must meet all applicable air quality standards and permitting requirements
- Preferred minimum site area of 160 acres
- Water source capable of condenser cooling and other makeup requirements

- Site must be in close proximity to at least one rail line and/or barge access for Montana Powder River Basin coal delivery
- Facility must have a competitive Net Present Value as compared to the cost of purchasing power

On behalf of SME, Stanley Consultants initially screened the entire state of Montana, identifying prospective power plant sites that were generally close to water bodies, transmission lines, substations, and railroads while at the same time avoiding Native American lands and Class I airsheds (national parks and national wilderness areas) (SME, 2005d). Risk factors with the potential to impede, delay or prevent development of the plant at a given site were identified. Figure 2-18 reveals a composite screening map of the state of Montana which identified these features.

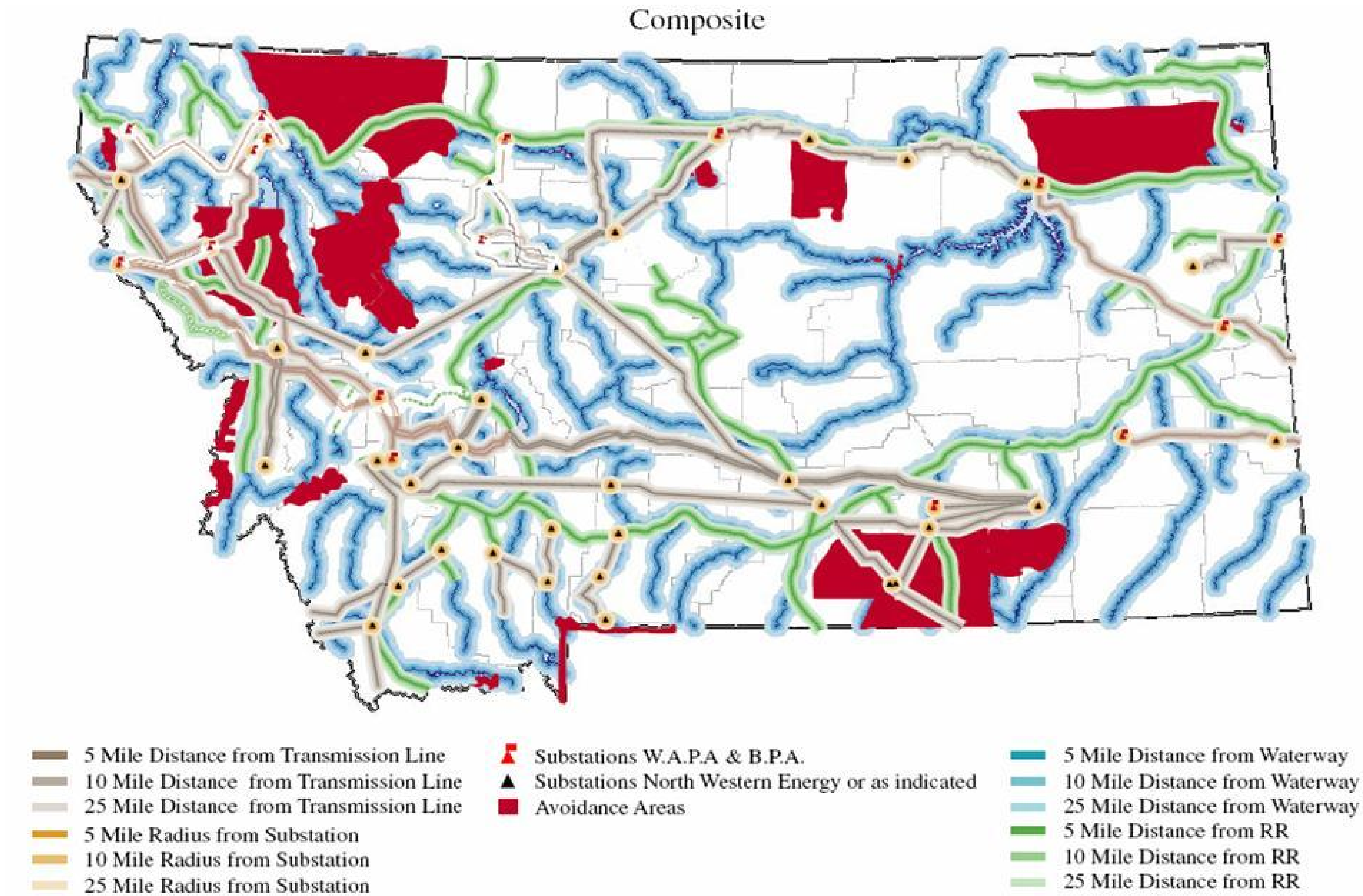
Seven sites in four main areas emerged from the initial screening process: Great Falls (including the sites identified as Salem and Salem Industrial or Industrial Park sites, as well as a site north of Malmstrom AFB), two sites at Decker, Hysham, and Nelson Creek. Their locations are shown in Figure 2-19. An artist's rendering of a power plant at each location is depicted in Figure 2-20.

The following factors were examined in more detail in the Site Selection Study (SME, 2004b):

- Heat rate, which considered the different types of coal and locations at which the coal would be utilized;
- Water consumption and wastewater discharge, including source and discharge points, and associated water rights issues;
- Environmental suitability, which includes the existing land use, air quality concerns, proximity to state or national parks and wildlife areas, existing or planned airports, and Native American lands;
- Site-specific costs for plant development and operation;
- Infrastructure improvements for both construction and operation, which included roads, railroads, water and natural gas pipelines, and transmission; and
- Conceptual cost and schedule benefits and impacts.

Based on the results of the site selection study, the Salem and Industrial Park sites (Sections 2.2.2 and 2.2.3 in this EIS, respectively) are considered reasonable locations for the proposed generating station. The Decker, Hysham, and Nelson Creek sites were unacceptable with respect to one or more of the factors summarized above, and, therefore, they are not analyzed in detail in this EIS. The major activities and components associated with construction of a 250-MW plant at each of these three sites are described in the following sections (2.1.8.1 through 2.1.8.3). Two other Great Falls area sites, not covered in the Site Screening Study, and the Malmstrom AFB site were also unacceptable and are discussed separately in Section 2.1.8.4.

Figure 2-18. Composite Map of Montana Depicting Features Relevant for Power Plant Development



SME, 2005d

Table 2-8 compares key features of five sites evaluated in the Site Selection Study.

Table 2-8. Comparison of Alternative Sites from the 2004 Site Selection Study (SME, 2004b)

Description	Unit	Salem	Industrial Park	Decker	Hysham	Nelson Creek
Fuel (coal) Consumption	Tons/year	1,135,800	1,135,800	1,101,200	1,230,000	1,626,800
Limestone Consumption	Tons/year	25,300	25,300	28,200	58,000	42,700
Ammonia Consumption	Tons/year	220	220	220	220	360
Ash Production	Tons/year	49,100	49,100	45,150	114,000	117,950
Transmission Line Construction	Miles	14	23	130	87	180
Railroad Spur Construction	Miles	6	8	4	2	0 (45 miles upgraded)
Raw Water Pipeline Construction	Miles	3	4.5	11	9	41
Transmission Facilities Cost Estimate	Thousands of dollars ($1,000)	$25,250	$25,250	$86,840	$67,575	$104,950
Total Installed Cost	Thousands of dollars ($1,000)	$469,555	$481,100	$553,096	$545,193	$692,292

Figure 2-19. Locations of Four Potential Areas in the Site Screening Study

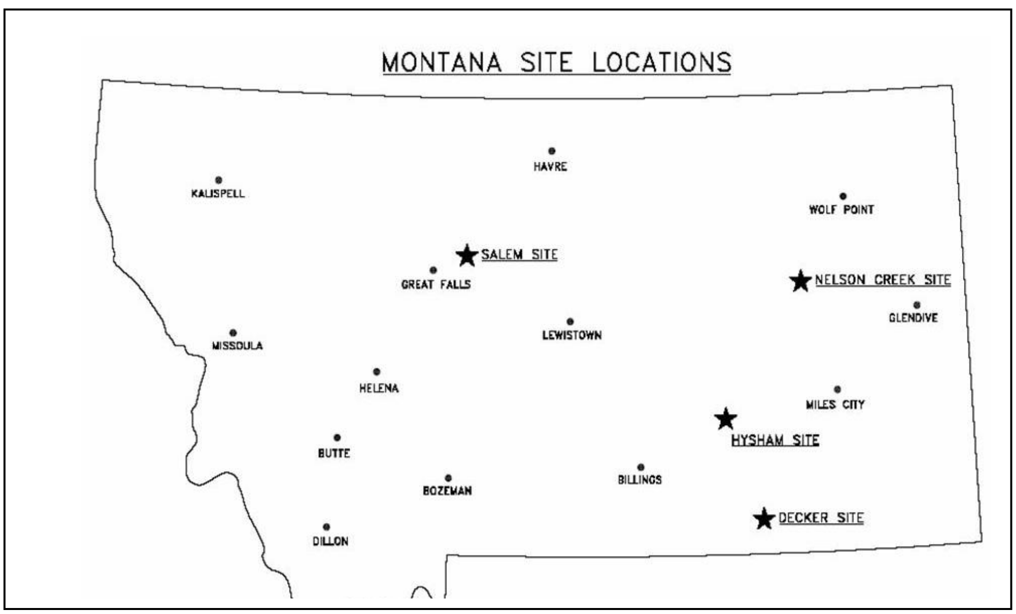
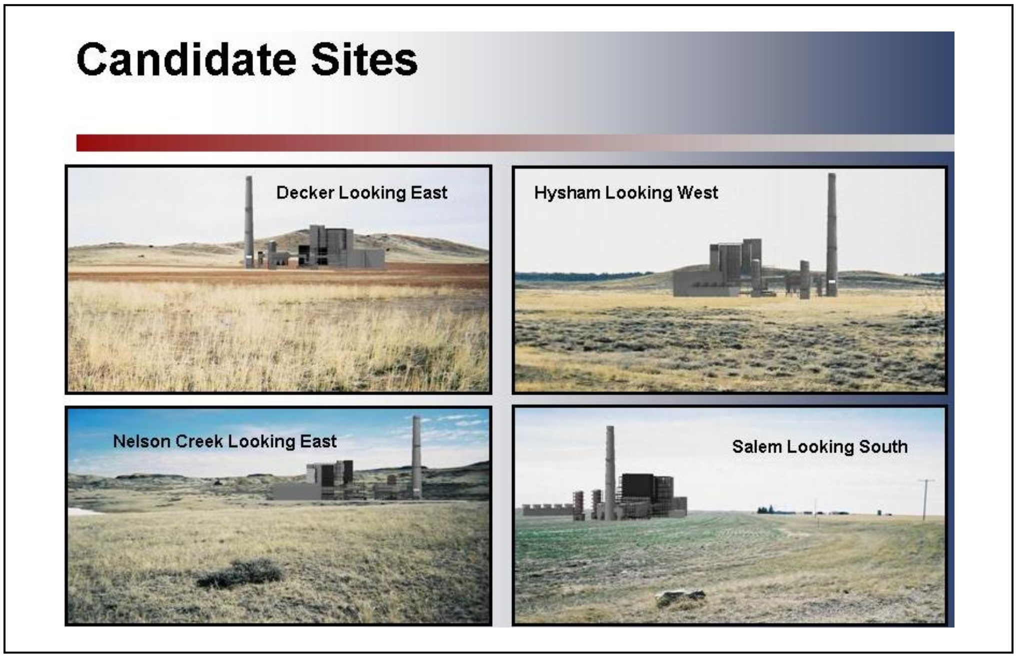


Figure 2-20. Artist's Renderings of a Coal-Fired Power Plant at the Four Candidate Locations



2.1.8.1 Decker

The Decker site is situated at an elevation of approximately 3,881 feet (1,183 m) above sea level, 30 miles (48 km) east of Interstate 90 and east of Highway 314 near the North Fork Monument Creek. The Decker site is in the Southwest ¼ of Section 1, Township 8 South, Range 39 East.

A generating station at the Decker site would consume an estimated 251,400 lb/hr (1,101,200 tons/yr) of sub-bituminous coal supplied by railroad from the Decker Mine. Four miles (6.4 km) of new track and railroad bed would be required from the existing Burlington Northern Santa Fe (BNSF) Railroad main line track system to the plant site.

Make-up water would be pumped from an intake structure on the west bank of the Tongue River Reservoir for a distance of about 11 miles (18 km) to the plant. This location is served by the smallest watershed of any of the sites. This stream appears to be heavily allocated. Average daily flow at the Tongue River dam during 2002 (a dry year) was 136 cubic feet per second. Allocations and claims on file total more than the average daily flow such that many junior users received less water than they wanted or were cut off during that time (SME, 2004b).

No.2 fuel oil would be delivered to the plant by truck for start-up. Limestone and ammonia would be delivered to the facility by railroad. Approximately 6,420 lb/hr (28,200 tons/yr) of limestone and 50 lb/hr (220 tons/yr) of ammonia would be consumed. About 10,300 lb/hr (45,150 tons/yr) of ash waste would be produced and trucked back to the Decker Mine for disposal (SME, 2004b).

Electricity produced at the plant would be transmitted to the existing Rosebud Substation and would require approximately 80 miles (129 km) of new transmission line. The plant at the Decker site would also interconnect with a new Tongue River Substation, which would be located east of the existing Colstrip Power Plant (SME, 2004b).

The Decker site would be more expensive than either of the Salem sites and would have a higher degree of risk associated with environmental permitting and approvals. It would also be subject to water disruption and the lack of available water rights, and was therefore eliminated from further consideration.

2.1.8.2 Hysham

The Hysham site is in the Southwest ¼ of Section 11, Township 6 North, Range 37 East. The site is approximately 2,879 feet (878 m) above sea level and is located about eight miles (13 km) south of the Yellowstone River on the west side of Old Sarpy Road (refer to Figure 2-22). It was formerly a gravel borrow site.

Figure 2-21. Looking West onto the Yellowstone River Near the Hysham Candidate Site

A generating station at the Hysham site would consume about 280,800 lb/hr (1,230,000 tons/yr) of sub-bituminous coal supplied by railroad from the Absaloka Mine (SME, 2004b). About 1.5 miles (2.4 km) of new track and railroad bed would be required from the existing BNSF Railroad main line track system to the plant site.

Make-up water would be pumped from an intake structure on the Yellowstone River, east of the City of Hysham, for about nine miles (6.4 km) to the plant. According to Montana Department of Natural Resources and Conservation (DNRC), much of the available water from the Yellowstone River is already allocated. An off stream storage structure, or arrangement, would most likely be necessary to guarantee the necessary flow (SME, 2004b).

Natural gas would be supplied to the plant for start-up fuel from an existing pipeline. Limestone and ammonia would be delivered to the facility by railroad. About 13,240 lb/hr (58,000 tons/yr) of limestone and 50 lb/hr (220 tons/yr) of ammonia would be consumed. Approximately 26,030 lb/hr (114,000 tons/yr) of ash waste would be produced and trucked to a landfill location on site (SME, 2004b).

Electricity produced at the plant would be transmitted to the existing Rosebud and Custer Substations. Approximately 34 and 53 miles (55 and 85 km) of new transmission line would be required to the Rosebud and Custer Substations respectively (SME, 2004b).

As in the case of the Decker site above, the Hysham site would be more expensive than either of the Salem sites and would also have a higher degree of risk associated with environmental permitting and approvals and available water supply and water rights. Therefore it was eliminated from further consideration.

2.1.8.3 Nelson Creek

The Nelson Creek site is in the Northwest ¼ of Section 36, Township 21 North, Range 43 East. The site is located southeast of Nelson Creek Bay, just east of Highway 24, at approximately 2,322 feet (708 m) above sea level.

A generating station at the Nelson Creek site would consume an estimated 371,400 lb/hr (1,626,800 tons/yr) of lignite coal supplied from a new mine located east of the plant. The coal would be delivered by heavy-haul mine trucks a distance of two miles on existing roads to the plant. It is estimated that over 45 miles (72 km) of existing railroad track from Glendive to Circle would need to be upgraded to accommodate the delivery of major equipment, and about 26 miles (42 km) of road improvements would be needed to transport major equipment by heavy-rigging trucks from the upgraded rail siding at Circle to the site.

Make-up water for the plant would be pumped from an intake structure located on Fort Peck Reservoir. A 41-mile (66-km) pipeline would be needed to supply the water to the plant. However, according to the DNRC, the Corps of Engineers has filed several water right claims for amounts approximating the capacity of the Fort Peck reservoir (SME, 2004b).

No.2 fuel oil would be delivered to the plant by truck for start-up. Limestone and ammonia would be delivered to the facility by trucks. Approximately 9,730 lb/hr (42,700 tons/yr) of limestone and 82 lb/hr (360 tons/yr) of ammonia would be consumed. About 26,930 lb/hr (117,950 tons/yr) of ash waste would be produced and trucked back to the new mine for disposal (SME, 2004b).

Electricity produced at the plant would be transmitted to the existing Rosebud and new Tongue River Substations. Ninety miles (145 km) of new transmission line would be required from the plant to the Rosebud Substation (SME, 2004b).

As with both the Decker and Hysham sites above, the Nelson Creek site would be more expensive than either of the Salem sites and would have a higher degree of risk associated with environmental permitting and approvals and available water supply and water rights. Therefore it was eliminated from further consideration.

2.1.8.4 Great Falls Area Sites

Prior to selecting the Great Falls Industrial Park Site and the Salem Site as the two preferred locations that would be carried forth in the EIS, SME considered a number of other locations in the Great Falls area as "high level" choices for its proposed CFB plant. Additionally, the Site Selection Study identified a preferred site in Section 36, Township 21 North, Range 5 East (termed the "Section 36 Site"), approximately one mile south of the Salem site in Sections 24

and 25. The following is a description of the other sites visited by SME on 17 December 2003 and considered but eliminated early on in the site screening/selection processes for reasons that rendered the sites unsuitable for a base load electric generation facility.

1. **Sun River Site:** This site is on land considered by the City of Great Falls as a location for a future landfill. This site is located on the north side of the Sun River and west of the Missouri River. The site is in close proximity to rail facilities but the spur line to a parcel of land suitable for a base load coal-fired electric generation facility would have required crossing Interstate 15 and would have resulted in transporting coal for the facility through Great Falls, posing a number of transportation problems. The site was also in relatively close proximity to a number of residential locations and had limited access even though it was in close proximity to Interstate 15. In addition to access problems the location was distant from a suitable location to draw upon the City of Great Falls' water reservation that would be used to provide raw water for plant operations. Finally, the parcel under consideration was limited to 160 acres and not adequate for the facility contemplated by SME.

2. **Manchester Area:** Manchester is a small rural community located west of Great Falls where there are a number of light industrial enterprises. On close examination the site posed a number of logistical problems. The site is in close proximity to rail facilities but a potential spur line would have required crossing Interstate 15 and a frontage road used to access local "bedroom communities," and would have resulted in transporting coal for the facility through Great Falls, posing a number of transportation problems. The site was also in relatively close proximity to a number of residential locations and had limited access even though it was in close proximity to Interstate 15. In addition to access problems the location was distant from a suitable location to draw upon the City of Great Falls' water reservation that would be used to provide raw water for plant operations. The closest large water body is the Sun River that has water quality and flooding issues. Finally, even setting aside the other drawbacks, it did not appear that a suitable parcel of land would be available for the facility contemplated by SME.

3. **Site North of Malmstrom Air Force Base:** This site, considered in both the site screening and site selection studies, is on the north boundary of the United States Air Force facility that serves as a hub for the operation and maintenance of the missile system installed in the 1960s and 1970s for the purpose of defending the Untied States from nuclear attack. The site received initial selection because of its proximity to the Missouri River and NorthWestern Energy's (NWE) Great Falls Substation. However, subsequent analysis revealed the following site-eliminating characteristics:

    - The available parcel of land would not be of adequate size for the proposed facility.
    - Malmstrom was in the process of aggressively expanding base housing in the direction of the most suitable location for the facility.
    - Malmstrom is fourth in line as an emergency location to land the Space Shuttle.

- The City of Great Falls was in the process of constructing a very large soccer complex that is heavily used and not compatible with a base load electric generation facility.
- The site is in close proximity to rail facilities but the spur line would have resulted in transporting coal for the facility through Great Falls, posing a number of transportation problems.

4. **Section 36 Site:** The Site Selection Study identified a site in Section 36, Township 21 North, Range 5 East, about one mile south of the Salem site. Field reconnaissance confirmed the site's potential to support a generating station. The site was rural, flat and close to water and rail and accessible to transmission facilities. In addition, it lay outside the boundary of the National Portage Site National Historic Landmark. Repeated efforts were made to contact the property owner regarding possible acquisition of the property, but the property owner was unresponsive. Thereafter, SME became aware of the availability of the adjacent Salem site and after discussions with the site owners, SME entered into option agreements to purchase the site in August and October 2004. Thus, as of Fall, 2004, the current Salem site was identified as one of two potential sites in Great Falls for development of HGS.

2.1.9 ALTERNATIVE COMPONENTS AT SALEM SITE

Five other alternative components at the preferred Salem site were considered and dismissed from more detailed consideration in the EIS.

2.1.9.1 Obtaining Potable Water from Other Sources

Potable or drinking water could be provided via imported bottled water, by drilling a groundwater well, or by installing a treatment system in order to use additional diverted Missouri River water as the drinking water source for the plant.

- Importing bottled water is an option to supply drinking water at the site and individual offices and staff may select to have bottled water dispensers available. However, bottled water would not be an option for supplying water for restrooms, outdoor faucets, and other non-industrial water uses. Bottled water would not be cost effective in large quantities for site-wide use for anything other than drinking water.
- Potable water for the HGS power plant could be obtained from one or more drinking water wells drilled on-site. SME rejected this alternative in part because of the 300-450-foot depth to the water-bearing Madison limestone formation (PBSJ, 2005). There are ample groundwater sources in the area of the site although not readily available and requiring a deep well. Some pretreatment of the water may be required in order to meet federal and state drinking water standards. The water treatment facility would be classified as a public water supply and would be subject to state and county regulations. The operator of this facility would have to be licensed by DEQ.
- An additional river diversion could be used to obtain potable water for the HGS or the industrial diversion could be upgraded to handle the additional volume of water. The river water would most likely require some pretreatment in order to meet federal and state

drinking water standards. The water treatment facility would be classified as a public water supply and would be subject to state and county regulations. The operator of this facility would have to be licensed by DEQ.

Construction of a 20 gallons per minute water treatment facility would result in additional disturbance of soils and plants at the facility location. Depending upon the type of water treatment method selected (reverse osmosis, ion exchange, etc.), additional chemicals or reagents may be needed which could in turn result in waste streams that must be selectively handled for disposal, such as the brine generated from a reverse osmosis facility. There would be a slight increase in traffic to the plant from the delivery of the needed chemicals and reagents, and the removal of waste products. The treatment facility may also require large quantities of electricity to operate as these are not passive systems. This alternative could cost anywhere from $250,000 to $750,000 to construct (approximate capital costs) and as much as $20,000 to operate each year, depending upon the treatment method selected. There would be annual operation and maintenance costs in addition to the need to hire licensed operators

Although obtaining potable water from a groundwater well or the Missouri River are feasible alternatives, they offer no environmental benefit over SME's Proposed Action to obtain potable water from the City of Great Falls. Either of these alternative sources would be available to SME as a contingency should it be unable to obtain water from the city. Since the construction and location of the raw water intake and pipeline are already analyzed in this EIS, DEQ would only need to analyze the impacts from the construction and operation of the public water treatment facility as required by state law (75-6-101 *et seq.*, MCA and ARM 17.38.101 and 102).

2.1.9.2 Discharging Wastewater into the Missouri River

This alternative would consist of discharging treated wastewater or effluent directly from the HGS into the Missouri River. SME would need to obtain an MPDES permit with wastewater parameter conditions or criteria from DEQ. SME rejected this alternative in favor of discharging into the City of Great Falls' wastewater treatment system on the grounds of environmental benefits, the cost to construct, operate, maintain, and monitor the facility, and the convenience of hooking into an existing permitted wastewater treatment and disposal facility. This alternative could cost anywhere from approximately $750,000 to $1,000,000 to construct and approximately $100,000 to operate each year depending upon the treatment method selected.

Construction of the plant would result in additional disturbance of soils and plants at the plant location. There may be some impacts to aquatic life downgradient of the discharge, although they would not be significant as long as the discharge complied with MPDES permit limits. In addition to operating costs, the facility must be maintained and effluent inflow and outflow must be monitored to ensure the discharge would comply with the MPDES permit.

Discharging treated industrial wastewater into the Missouri River from the HGS is a feasible and reasonable alternative. However, given the capacity of the City of Great Falls wastewater treatment facility (see Proposed Action description in Section 2.2.2.2 below), there are no additional environmental benefits associated with the construction, operation, maintenance, and monitoring of an on-site wastewater treatment facility and discharge into the river.

2.1.9.3 Disposal of Sanitary Wastewater in Septic System

Disposing of sanitary wastewater in a septic system was reviewed as an alternative to including it in the wastewater stream proposed to be sent to the City of Great Falls wastewater treatment facility. Under state law, this system would qualify as a public sewer system (75-6-101 *et seq.*, MCA and ARM 17.38.101 and 102), and the operator of this facility would have to be licensed by DEQ. SME would be required to submit plans to DEQ or a delegated division of local government for review and approval.

Construction of a sewer system would result in the disturbance of additional soils and vegetation for the treatment facility and the septic field. There would be some limited potential for seepage from the septic field to reach groundwater. Modest annual operation and maintenance costs would be incurred.

Although a public sewer system is a feasible alternative, it offers no environmental benefits over SME's proposed connection and use of the City of Great Falls wastewater treatment for disposal and treatment of sanitary wastes.

2.1.9.4 Alternate Railroad Spur Alignments

Three possible rail spur alignments were evaluated for cost, environmental impacts, impacts to land owners, and impacts to residents of the City of Great Falls. The two alternate routes were eliminated from further consideration.

- The railroad spur could be routed south from the power plant to the abandoned railroad grade, then placed along this railroad grade toward the city of Great Falls and tied into existing track north of Malmstrom Air Force Base. This alternate route would be 8.6 miles (13.9 km) long – 2.3 miles (3.7 km) longer than the proposed alignment. A short portion of the abandoned railroad grade immediately north of Malmstrom Air Force Base has been converted into a construction and demolition waste landfill and is no longer on grade; the spur would have to avoid this landfill. Other disadvantages include: the necessity of reworking and replacing sections of the existing, abandoned railroad grade to comply with modern standards; a route that would divide certain privately owned croplands against the wishes of their owners; and routing HGS-related coal train traffic through the City of Great Falls, where some residents have expressed concerns about wait times at existing at-grade street crossings.
- The railroad spur could be routed north from the power plant and towards the city of Great Falls along property lines. This alternate route would also tie into the existing track north of Malmstrom Air Force Base. This route would be 8.5 miles (13.7 km) long – 2.2 miles (3.5 km) longer than the proposed alignment. Other disadvantages include: difficult and expensive installation due to the rough terrain that would be crossed; greater environmental impacts at crossings of coulees and watercourses; and the highest estimated cost due to the large structures (either bridges or trestles) that would be needed.

These two alternate railroad spur alignments would provide no beneficial advantage over SME's proposed route, and were therefore, eliminated from further consideration.

2.1.9.5 Hauling Ash to the High Plains Landfill

SME investigated hauling ash to the High Plains Landfill (see Figure 2-25) rather than storing the ash in a monofill on site. This alternate method of disposing of this material would require approximately 10-12 trucks per day to be hauled through the City of Great Falls along S-228 and U.S. 87. The hauling of the ash would add to the wear and tear and required maintenance of the city and county roads used en route to and from the HGS at the Salem site. SME would either be required to maintain a fleet of trucks or hire a firm to haul the material resulting in increased costs of approximately $180,000-$220,000 per year to haul the ash to the High Plans landfill. Given that SME and DEQ believe that the bedrock beneath the proposed facility and the compacted clay liner would minimize downward migration of contaminated water into the ground water there would be no beneficial advantage to hauling the ash approximately 25 miles (40 km) one-way to the landfill.

2.1.10 CONCLUSION

The projected levelized costs for new utility power generation plants in the Montana area are documented in Table 2-9. The power-generation technologies presented with their respective competitive costs are wind, solar, hydroelectric, geothermal, biogas, MSW, NGCC, microturbines, PC, CFB and IGCC. Wind, solar, and hydroelectric power have average capacity factors which range from 26 to 50 percent and cannot be considered for base load service.

A comparison of the alternate technologies regarding their capability of meeting the SME purpose and need criteria is documented in Table 2-10. Only the PC and CFB coal technologies are capable of meeting all of the criteria. NGCC offers the average capacity factor SME requires and the capital cost component of the levelized cost of NGCC power is attractive as compared to a CFB or pulverized coal plant. However, the volatility of natural gas prices results in NGCC being a costly option for SME's member cooperatives and customers.

The alternative of using oil as a fuel source, not displayed in Tables 2-8 and 2-9, was rejected on the basis of high current and probable future fuel costs as demand for this commodity continues to increase globally and supplies become more limited or insecure.

CFB has been selected as the preferred technology which would satisfy the projected SME base load needs due to its combination of environmental, economic, and technical advantages over other alternatives. The summary analysis of the Decker, Hysham and Nelson Creek sites above assumed the construction and operation of a CFB coal-fired power plant at each location. These sites advanced through the initial screening process but were rejected in favor of the two Salem sites (Salem and Industrial Park) on the basis of both economic and environmental factors (such as available water). In the following sections, the Salem and Industrial Park sites are described, along with the No Action Alternative.

Two project alternatives at the Salem Site – obtaining potable water from aquifers rather than the City of Great Falls municipal drinking water system, and discharging treated wastewater into the Missouri River rather than the City of Great Falls' municipal wastewater collection and

treatment system – were rejected on the basis of greater convenience and environmental advantages as well as lower cost.

Table 2-9. Levelized Costs for New Utility Power Generation Plants in Montana

Type of Power Plant	Levelized Costs ($ MWh)				
	Capital Cost	Fixed O&M Cost	Variable/ Fuel Cost	Total Busbar Cost[1]	Average Capacity Factor
Wind	35.9	7.7	7.0[2]	50.6	26-36%
Solar photovoltaic	N/A	N/A	N/A	350.0	20-35%
Solar thermal	N/A	N/A	N/A	105.0	20-35%
Hydroelectric	17.0	2.6	4.0	23.6	40-50%
Geothermal	N/A	N/A	N/A	65.0	90%
Biomass	N/A	N/A	N/A	90.0	90%
Biogas	37.0	6.6	3.0	46.5	90%
Municipal Solid Waste (MSW)	32.8	38.9	13.0	84.8	90%
Natural Gas Combined Cycle	19.0	2.3	41.0	62.3	90%
Microturbines	49.1	8.4	55.7	113.2	90%
Pulverized Coal (PC)	33.8	4.6	11.7	50.1	90%
Circulating Fluidized Bed Coal (CFB)	25.2	4.6	12.8	42.6	90%
Integrated Gasification Combined Cycle Coal (IGCC)	42.8	3.3	19.8	65.9	<80%

Source: SME, 2004a
Notes:
[1]Busbar Cost – wholesale cost to generate power at the plant
[2]Variable cost for wind power represents transmission costs
$/MWh – dollars per megawatt hour
O&M – operation and maintenance

Table 2-10. Comparison of Alternative Power Generation Technologies in Meeting the Purpose and Need of the Proposed Action

Capable of Meeting Purpose and Need Criteria

Type of Power Plant	250 MW in 2012	Baseload Operation	Environmentally Permitable	Cost Effective	Fuel Cost Stability	High Reliability	Commercially Available	Meets All Criteria
Wind	Yes	No	Yes	Yes	Yes	No	Yes	No
Solar-Photovoltaic	No	No	Yes	No	Yes	No	Yes	No
Solar-Thermal	No	No	Yes	No	Yes	No	Yes	No
Hydroelectric	No	No	Difficult	Yes	Yes	Yes	Yes	No
Renewable Energy Sources Combined	Yes	No	Yes	No	Yes	No	Yes	No
Geothermal	No	Yes	Yes	N/A	Yes	Yes	N/A	No
Biomass	No	Yes	Yes	No	Yes	Yes	Yes	No
Biogas	No	Yes	Yes	Yes	Yes	Yes	Yes	No
Municipal Solid Waste	No	Yes	Difficult	No	Yes	No	Yes	No
Natural Gas Combined Cycle	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Microturbines	No	No	Yes	No	No	Yes	Yes	No
Pulverized Coal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oil	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Nuclear	No	Yes	Difficult	Yes	Yes	Yes	Yes	No
CFB Coal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IGCC Coal	Yes	Yes	Yes	No	Yes	No	Yes	No
CFB and Renewable Sources Combined	Yes	No	Yes	No	Yes	No	Yes	No

Note: Based on alternate power plant options located within or adjacent to the SME system

2.2 ALTERNATIVES TO BE ASSESSED IN DETAIL

This section describes the alternatives that are considered reasonable and are analyzed in detail in this EIS. For an alternative to be judged reasonable, it must meet the purpose and need for proposing a new energy generation source for the SME service area, which is to provide wholesale electric energy and related services for the SME service area. Reasonable alternatives must be affordable, reliable, and stable sources of wholesale electric energy, and they cannot pose unacceptable environmental risks.

Several sites in the SME service area were evaluated in 2004 to determine their suitability for constructing a 250-MW CFB coal-fired power plant. Factors considered in assessing the sites were: relative costs of site development, projected production costs, environmental impacts and the cost of mitigation, the availability of an adequate source of water; movement of electrical power, the load centers for the member cooperatives, proximity to nearby fuel sources, and ability to obtain environmental permits. In addition to the No Action Alternative, this section describes the two sites that meet these criteria and are evaluated in detail in the EIS.

2.2.1 NO ACTION

Under the No Action Alternative, the Highwood Generation Station would not be constructed or operated to meet the projected 250-MW base load needs of SME. There would be no facilities constructed at either the Salem or Industrial Park sites to meet the purpose and need discussed in Chapter 1 of the EIS.

However, it is unreasonable to assume that no alternative source of electricity would be provided for SME customers once the current power purchase agreement with the Bonneville Power Administration begins to expire. Member cooperatives and consumers would not simply “do without.” Therefore, the primary assumption for the No Action Alternative is that the need for a reliable energy supply for the SME service area would still be met by some means. At the same time, the No Action Alternative needs to describe the consequences of taking the minimal action necessary to provide uninterrupted power. In that case, SME would not investigate other cost-effective and potentially reliable energy sources, nor would efforts be made to extend the current power purchase agreements.

At a minimum, however, SME would need to purchase power from existing sources of wholesale supply. As stated in Section 2.1.1, because of projected increased costs, SME estimates the price it would pay under new power purchase agreements could be as much as double its current costs (SME, 2004a). These increased costs would be passed on to SME’s residential, commercial and industrial customers. This action would also promote the continued use of existing generation sources which in many cases are inefficient coal-fired sources with higher emissions than the proposed preferred action.

2.2.2 PROPOSED ACTION: HIGHWOOD GENERATING STATION – SALEM SITE

In response to concerns expressed during the DEIS review and Section 106 consultation processes about its potential impacts on the Great Falls Portage National Historic Landmark, the proposed HGS power plant has been reconfigured and shifted to the south by approximately one-half mile, to a site just outside the NHL boundary. As a result of this modification, the locations of the proposed railroad loop and ash disposal cells within the loop would shift to the southeast. The railroad spur would not entirely avoid the NHL. The wind turbines would be located in a different alignment, but not off the NHL because of constraints on suitable locations for wind turbines on the Salem site. In the vicinity of the plant, the proposed transmission lines and water lines would also be moved accordingly, although these would still cross the NHL. Accordingly, the descriptions in this section now refer to the new locations of these facilities.

The Salem site is located in Sections 24 and 25, Township 21 North, Range 5 East at about 3,300 feet (1,006 m) above sea level (Figures 2-22 and 2-23). It is east and north of the intersection of Salem Road and an abandoned railroad bed. Figure 2-24 depicts the Salem site and the Industrial Park site in relation to each other, the Missouri River, and the City of Great Falls. Figure 2-25 depicts the boundaries of the property SME would purchase for the HGS in comparison with the Great Falls Portage National Historic Landmark boundaries, while Figure 2-26 depicts the preliminary arrangement of key facilities on the Salem site. Figure 2-27 depicts relative and approximate heights, elevations and sizes of the main CFB plant features.

2.2.2.1 Construction

Construction is estimated to take approximately four years and three months (51 months) from breaking ground to commercial operation of the plant. Construction would begin with site preparation, foundations, and underground utilities, while design of the above-ground mechanical, piping, buildings, structures, and electrical systems is being developed.

The existing aggregate roadways currently leading to the site would be used and maintained during construction. After construction, these existing roadways would be regraded and covered with additional aggregate. A 1,800-ft (545-m) long paved access road into the site would be constructed and maintained from the existing Cascade County road, Salem Road. Additionally, 6,600 feet (2,000 m) of paved internal roadways would be constructed to facilitate both the construction and operations phases of the plant. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction.

Site grading and preparation has a planned duration of approximately two months and would be followed by foundation construction, with a planned duration of approximately a year. Using a phased process, boiler and baghouse construction would commence approximately five months after the beginning of the foundation construction and would be completed in approximately two years. Once the foundation is complete, the installation of the turbine generator components would begin and be completed in one year. Construction activity is planned to occur over an approximate four years and three months duration during which employment would average between 300 and 400 workers at any one time with an estimated peak construction workforce approaching 550 (SME, 2005j).

Figure 2-22. View of the Salem Site Looking Toward Highwood Mountains

Figure 2-23. Another View of the Salem Site

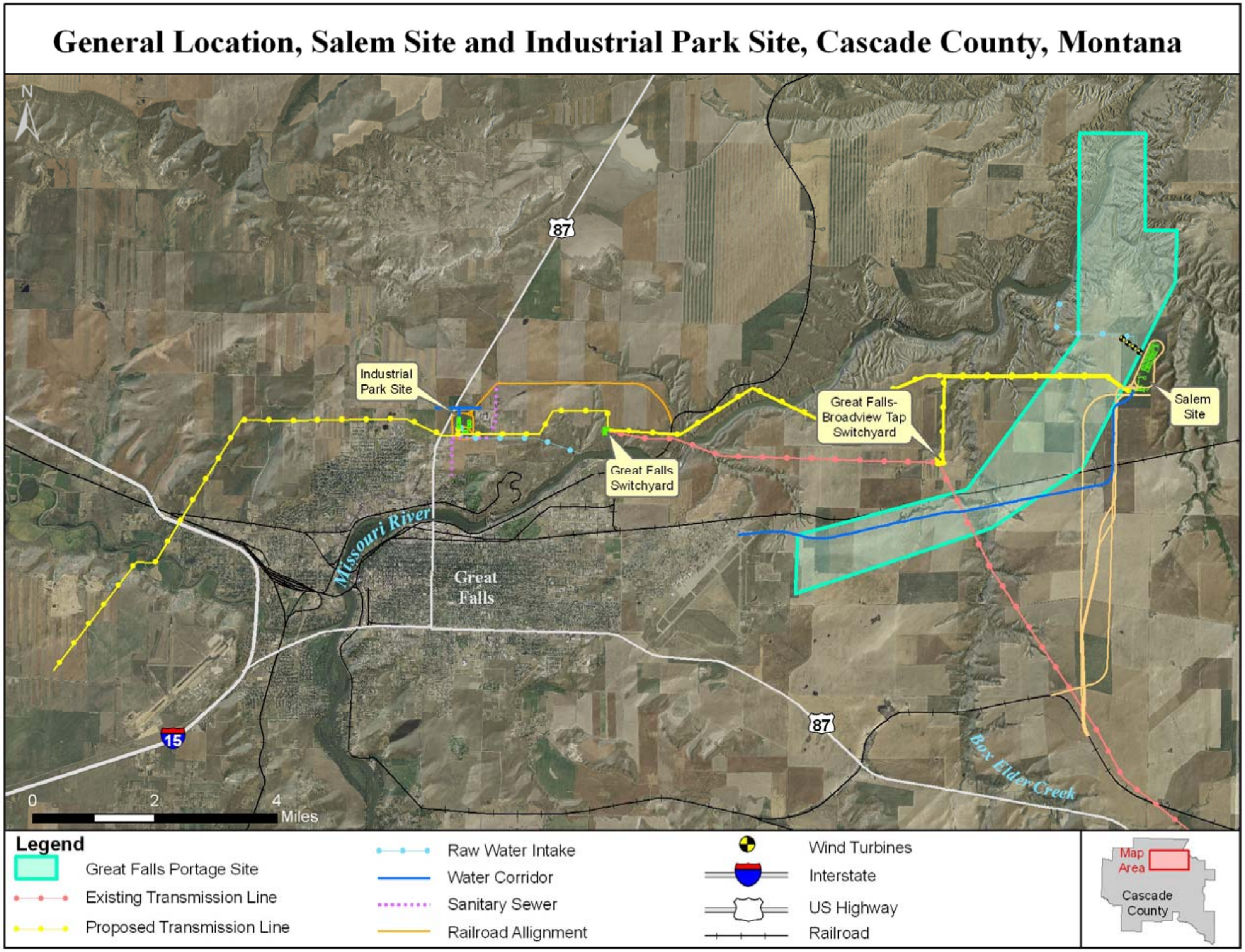


Figure 2-24. Vicinity Map of Highwood Generating Station (Salem and Industrial Park Sites), Great Falls, and Missouri River

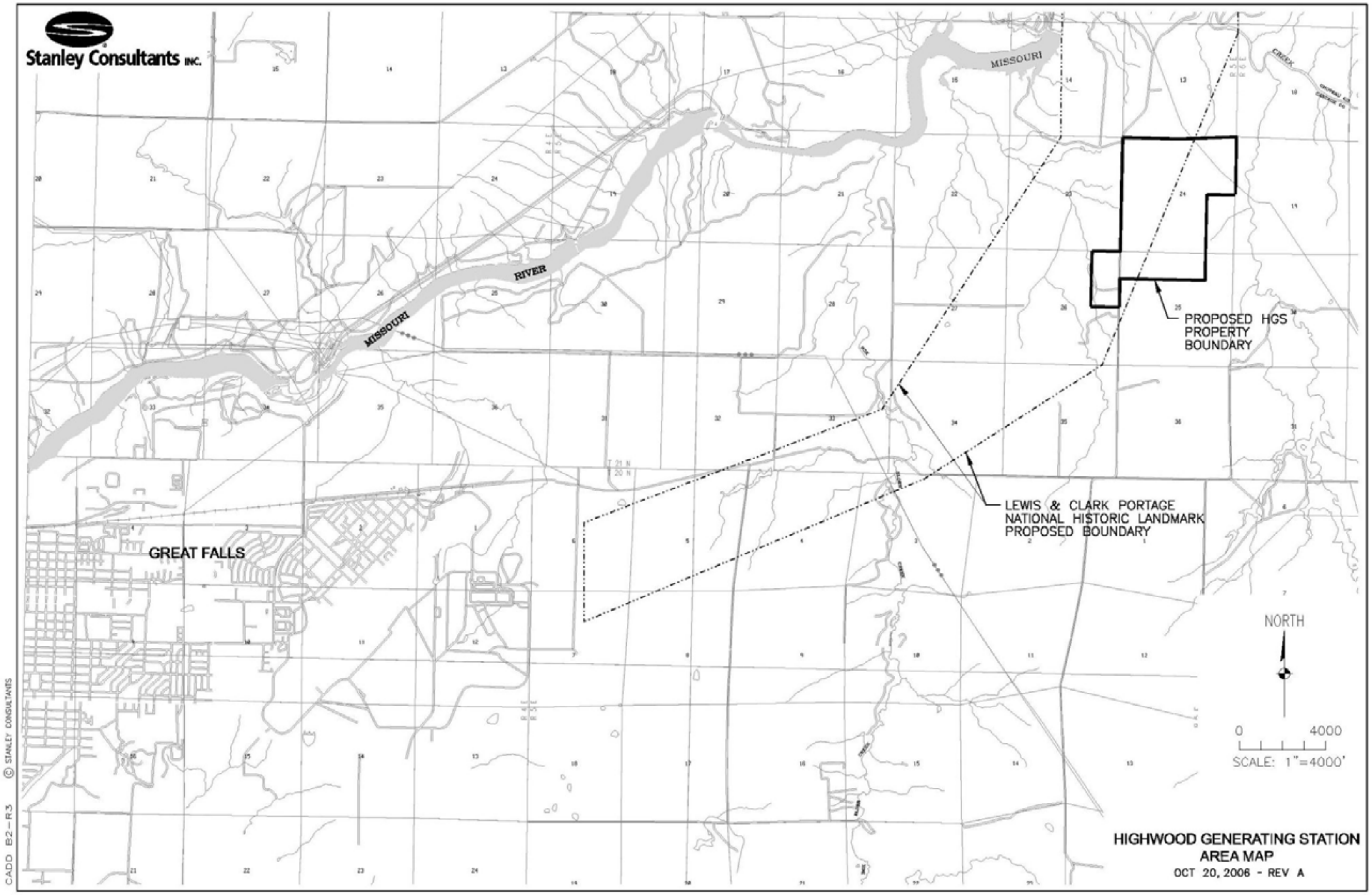


Figure 2-25. Proposed Property Boundary of the Highwood Generating Station in Comparison with the Great Falls Portage National Historic Property Boundary

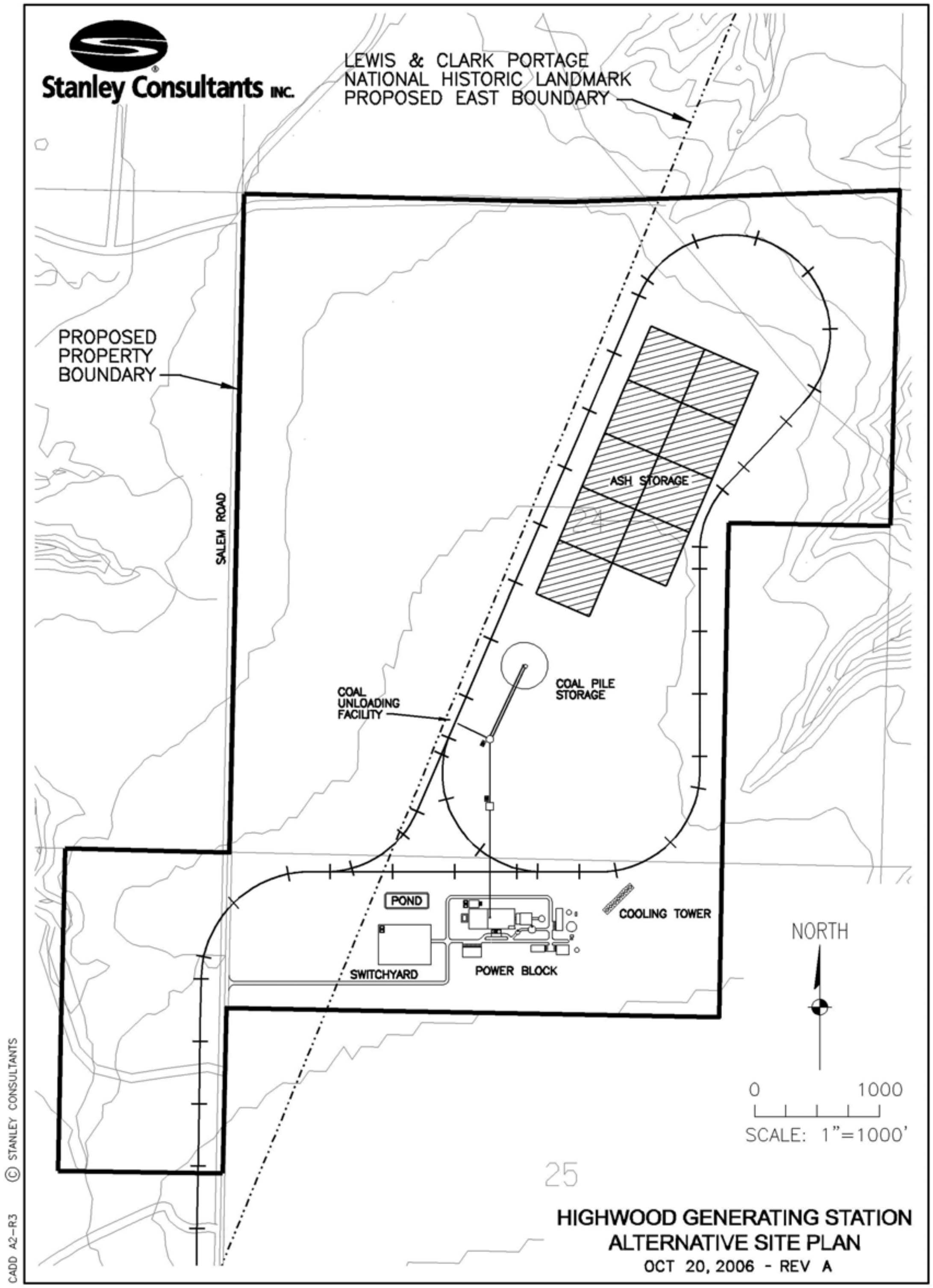


Figure 2-26. Preliminary Site Configuration of the Highwood Generating Station in Comparison with NHL Boundary

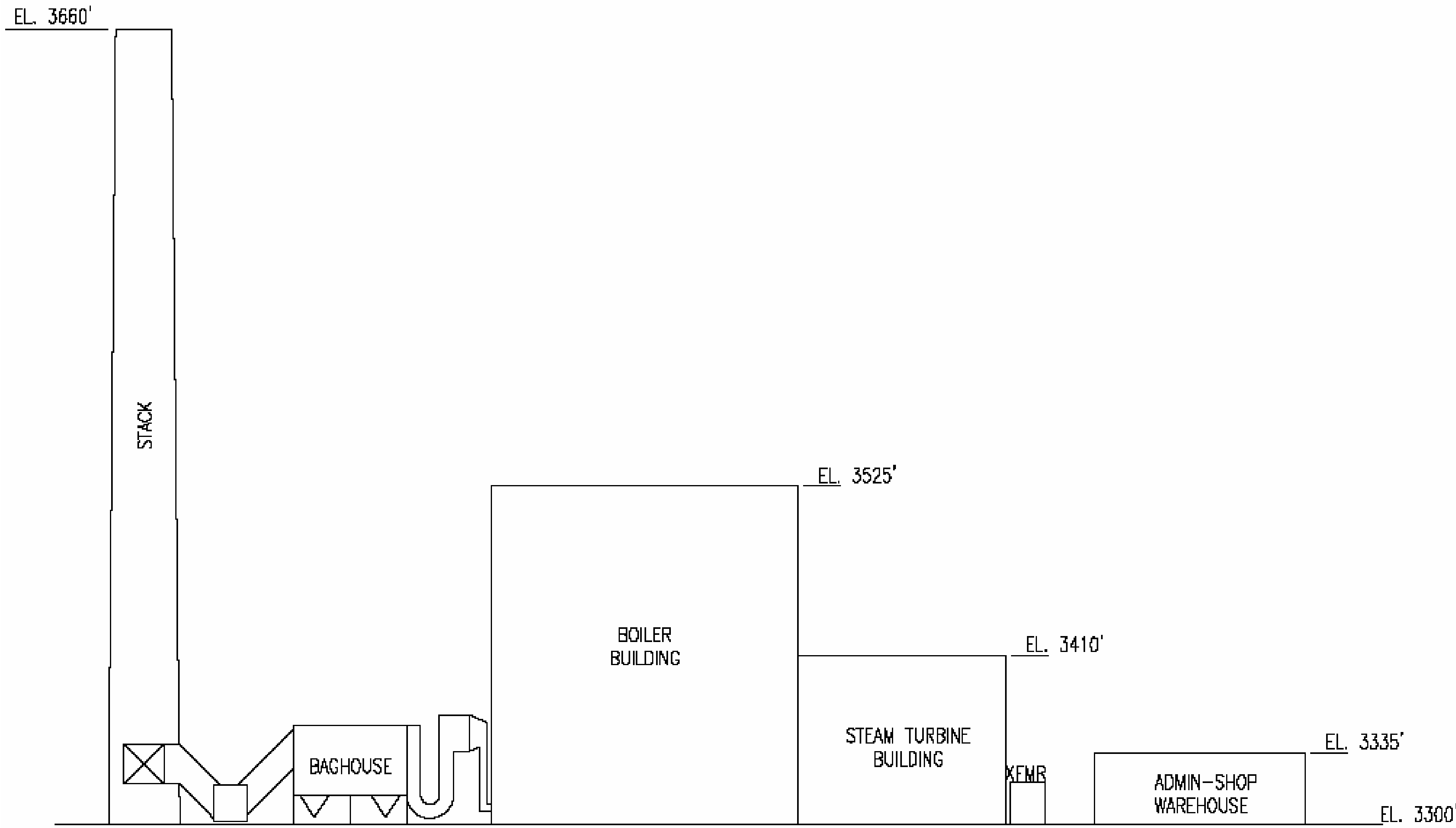


Figure 2-27. Relative and Approximate Heights, Elevations and Sizes of the Main CFB Plant Features (Preliminary)

In order to supply coal to the HGS, it would be necessary to install a railroad spur. The spur would extend from one of the existing rail lines in the area to the plant site. SME selected one of the three possible rail spur corridors evaluated for cost, environmental impacts, impacts to land owners, and impacts to residents of the City of Great Falls. The spur would be routed south from the plant and tie into existing main line track that is located three miles (five kilometers) south of the city of Great Falls. SME is in the process of choosing one of three possible alignments of the spur within the preferred rail corridor (Figure 2-24). The ultimate selection would attempt to minimize landowner and NHL impacts.

SME selected the preferred rail corridor based on cost and minimizing environmental concerns. It has several advantages:

- Shortest alignment at approximately 6.3 miles (10.1 km);
- No watercourse crossings required, which minimizes environmental impacts;
- Coal originates in southern Montana so the coal trains would be switched onto the spur resulting in no increase of train traffic in the City of Great Falls;
- Lowest estimated cost;
- No need to relocate construction and demolition waste landfill.

The two disadvantages of this route versus the other two options studied are that the tracks would cross Montana State Highway S-228, Highwood Road, which would require an expensive highway overpass, and it would cross agricultural land which would need to be reviewed with local property owners (SME, 2005e).

Figure 2-28. Morony Dam and Reservoir at Site of Proposed Water Intake Structure

The HGS would require a reliable source of raw water for operations. The proposed water supply for both the primary and alternate sites is the Missouri River. The water rights for supplying the water would be from an existing water reservation that is owned by the City of Great Falls (City). The City would continue to own the water reservation and would sell the water to HGS through an agreement between the City and SME. However, the current points of diversion and places of use authorized under the existing water reservation do not include those required by the preferred HGS plant site. Therefore, the City has prepared and submitted an application to the Montana Department of Natural Resources and Conservation to add a point of diversion and place of use consistent with the preferred site (SME, 2005f).

Raw water for the preferred Salem HGS plant site would be obtained from the Missouri River approximately 0.4 mile (0.6 km) upstream of Morony Dam. Morony Dam is owned and operated by PPL Montana, a subsidiary of the former Pennsylvania Power & Light Company.

The land directly adjacent to the reservoir is also owned by PPL Montana. Morony Dam is operated as a run-of-the-river generation facility. Therefore, the outflow is maintained essentially equal to the inflow. The Morony Reservoir (Figure 2-29) has a capacity of approximately 13,889 acre-feet and covers an area of approximately 304 acres (123 ha). Presently, there is no public access to the reservoir for recreational purposes.

The raw water supply system would consist of a collector well which would use a passive intake screen installed on the end of a lateral pipe that extends into the Morony Reservoir. The intake screen would be located and designed to prevent sediment and debris from entering the system while also providing protection to aquatic life. The passive intake would be designed according to Section 316(b) of the Clean Water Act which applies to new cooling water facilities that withdraw between two and 10 million gallons per day (MGD). Pursuant to that Act, the maximum throughscreen intake velocity must be less than 0.5 feet per second (fps). The diameter of the intake screen to be installed on the pipe extending into the river would be sized to meet the impingement velocity requirement and address Clean Water Act requirements.

A reinforced, below-grade, concrete caisson or sump (vertical cylinder) would be constructed near the river and would serve as the intake's "wet well." The caisson would be located outside of the floodplain. A fully enclosed pump house would be located on the top of the caisson with a finish floor elevation at approximately grade. The pump house would contain two pumps designed to deliver a maximum of 3,200 gallons per minute (gpm) to the plant site. The pumps would deliver the water to the HGS plant site through a buried pipe approximately 2.3 miles (12,200 ft or 3,720 m) long.

SME has options to obtain the necessary easements for the construction, operation and maintenance of the raw water system from the property owners. SME would also need to obtain permits from county, state, and federal regulators for the construction, operation and maintenance of the raw water system (SME, 2005f). On March 21, 2006 SME submitted a Joint Application to these authorities, including DEQ and the Army Corps of Engineers. On November 20, 2006 the Helena Regulatory Office of the Army Corps of Engineers' Omaha District advised SME that the proposed activity (intake structure and overhead power line crossing of the Missouri River) was covered by Nationwide Permit 12 (Utility Line Activities).

If wastewater were to be discharged into the Missouri River, construction of a second discharge pipeline would be needed. However, the preferred option at present is to discharge wastewater back to the City of Great Falls for disposal at its existing waste water treatment facility. The wastewater would be transported via a 12" newly constructed sanitary force main that would run from the project site to a point near Malmstrom Air Force Base where the line would intersect an existing waste water line owned by the City of Great Falls. The length of the pipeline and main improvements would be approximately 53,000 feet (16,160 m). SME would need to obtain a permit from the City and meet pre-treatment effluent standards.

In order to export electrical power from the HGS it would be necessary to construct two short segments of 230 kV transmission line. The first line segment, approximately 4.1 miles (6.6 km) long, would extend from the plant site to a new 230kV switchyard site proposed for a location south and west of HGS. This terminus point coincides with an existing three pole wood deadend

transmission structure on NorthWest Energy's (NWE) Broadview to Great Falls 230kV Transmission Line (ECI, 2005). The proposed switchyard would consist of the following:

- 180 ft. by 240 ft. (55 to 73 m) fenced switchyard
- Standard 230 kV ring bus
- 230 kV switching equipment and related hardware
- Lightning protection
- Control house that would contain relaying and communications equipment.

The second line segment, approximately 9.1 miles (14.6 km) long, would extend slightly north and then west from the plant site, across the Missouri River west (upstream) of Cochrane Dam and terminate at NorthWest Energy's existing Great Falls Switchyard, located north and west of Rainbow Dam.

Both line segments would be constructed in new rights-of-way typically extending 50 feet (15 m) either side of centerline. Single pole weathering (corten) steel pole structures would be utilized for the entire length of both lines except where necessary to cross the Missouri River. Multiple-pole or H-frame structures may be required at this crossing point to maintain proper phase-to-phase and phase-to-ground clearances.

All running angle and deadend structures would be supported by steel-reinforced concrete caisson foundations, eliminating the need for guys and anchors. All tangent structures would be direct embedded utilizing native or engineered soils as backfill. Structures are anticipated to vary in height between 80 and 100 feet (25-30 m) and would be constructed approximately every 500-700 feet (150-215 m) along the rights-of-way depending upon terrain and obstacles. Insulation would be provided by use of composite post and/or suspension insulators depending on the ultimate structure configuration chosen. The single circuit lines would consist of three 1272 kCM phase conductors protected by a single 3/8" (1 cm) EHS shield wire.

2.2.2.2 Operation

Once construction was completed, plant start-up activities would be initiated with a planned duration of eight months and must be completed before commercial operation of the plant could begin. Plant operation would employ approximately 65 permanent workers (SME, 2005j).

The plant design consists of a CFB boiler, single re-heat tandem compound steam turbine, seven stages of feedwater heating, water-cooled condenser, wet cooling tower, hydrated ash reinjection, FGD system, baghouse, and material handling system. Figure 2-27 depicts the general location of equipment including the boiler, turbine building, exhaust stack, coal yard, switch yard, cooling tower, and site roads. Figure 2-29 depicts the main elements of a CFB coal-fired power plant.

The plant would purchase sub-bituminous coal from either the Spring Creek or Decker mines in Montana's Powder River Basin (PRB), or other suitable supply from which comparable PRB coal supplies are produced. Coal consumption is estimated to be 300,000 lb/hr or 1,314,000 tons/yr, based on SME's air permit application. Coal would be delivered approximately twice a

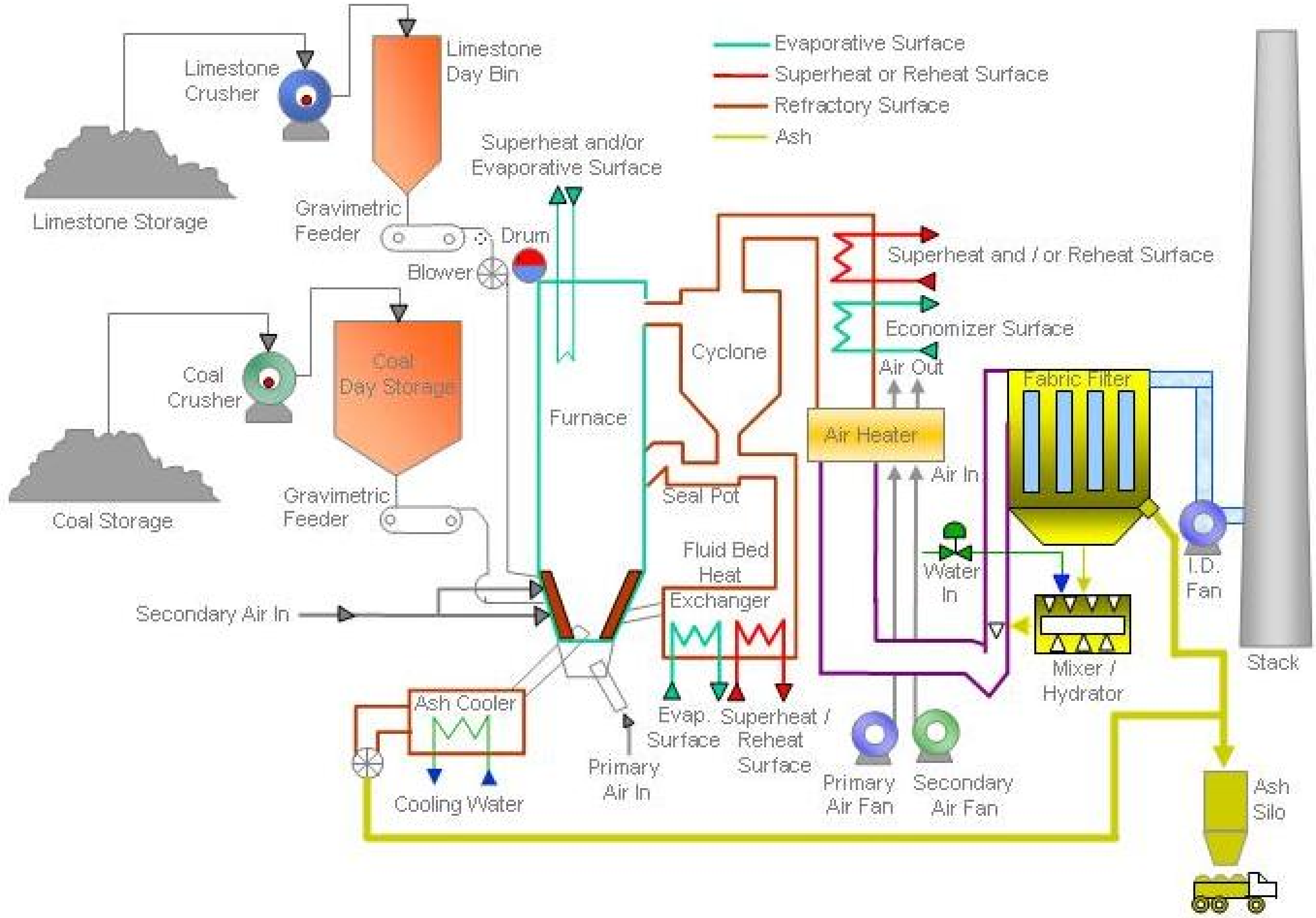


Figure 2-29. Circulating Fluidized Bed (CFB) Process with Hydrated Ash Reinjection*

*This figure represents a generic CFB process schematic. Reference to any individual component's inclusion or exclusion is determined on a project by project basis.

week in 110 bottom-dump rail car trains. The rail cars empty into a track hopper which feeds the coal to a transfer tower. The transfer tower moves the coal to either a coal silo or a storage pile. Feeders direct the coal from storage to the coal crusher building on two belts. The crushed coal is conveyed into one of four coal bunkers.

Limestone and ammonia would be purchased and utilized to reduce air pollutants. Limestone would be consumed at a rate of approximately 5,780 lb/hr or 25,300 tons/yr. Limestone would be delivered to the plant by truck from the Graymont Lime Plant and limestone quarry near Townsend, Montana. The bottom-dump trucks would empty their loads into a hopper, which feeds the limestone to a storage silo. From there the limestone would be crushed to reduce its size. The crushed limestone would then be transported to the CFB boiler to be utilized in the coal burning process.

Ammonia would be consumed at a rate of 239 lb/hr (1047 tons/yr), according to SME's air permit application. Anhydrous ammonia would be purchased and delivered to the plant by rail or by truck. The ammonia would be pumped from a rail unloading station from the rail car or truck to a horizontal storage tank. The ammonia would then be pumped from the storage tank to a vaporizer skid where steam is used to evaporate the liquid ammonia. Vaporized ammonia leaves the vaporizer and mixes with dilution air prior to injection into the boiler as a reagent for reducing NOx. System design safety features include separation distances, leak detection, spray and fogging systems, shower and eyewash stations, and containment barriers.

The facility power output rate is estimated to be a nominal 270 MW gross (250 MW net). It would be a low-emitting facility as a direct result of the application of state-of-the-art air pollution control technologies. The facility has been designed to minimize environmental impacts and environmental systems and equipment have been incorporated into the design of the facility.

The primary source of emissions to the atmosphere from the proposed generating station would be the CFB boiler (Figure 2-30). The CFB boiler itself, a "clean coal" technology, is an integral part of the proposed pollution control systems. By operating at lower temperatures, a CFB boiler generates lower NOx emissions than a comparable pulverized coal boiler. The CFB design also injects limestone into the boiler for control of SO_2 emissions and acid gas emissions (e.g. sulfuric acid or H_2SO_4 mist). Larger particles of unburned boiler bed material (coal and limestone) are separated in a cyclone from the boiler flue gas stream and "circulated" back into the CFB boiler. This circulation of unburned or heavy material provides for complete combustion of the coal and longer limestone residence times for more efficient collection of pollutants.

In addition to emission controls inherent in the CFB boiler design, SME proposes to install a fabric filter baghouse to reduce potential emissions of PM and PM_{10}. Potential NOx emissions would be further reduced using selective non-catalytic reduction (SNCR) technology and additional SO_2 and acid gas polishing would be accomplished using a HAR FGD system (refer to Figure 2-29). The use of best combustion practices would limit emissions of CO and VOC. Table 2-11 provides a summary of the proposed emission control systems and projected emission rates for PSD pollutants from the facility as presented in the draft air quality permit from DEQ

(DEQ, 2006a). The draft air quality permit has been subject to comment from the public, including SME, and may change depending on such comments.

Table 2-11. Best Available Control Technology (BACT) for proposed CFB at HGS

Pollutant	Proposed BACT Emission Limit	Proposed BACT Technology
NOx	0.07 lb./MMBtu	CFB Boiler and Selective Non-Catalytic Reduction
SO_2	0.038 lb./MMBtu	CFB Boiler with Limestone Injection and HAR FGD system
PM_{10} (filterable)	0.012 lb./MMBtu	Fabric Filter Baghouse
PM_{10} (condensable)	Included in the PM_{10} (total) limit	CFB Boiler with Limestone Injection, HAR FGD system, and Fabric Filter Baghouse
PM_{10} (total)	0.026 lb./MMBtu	CFB Boiler with Limestone Injection, HAR FGD system, and Fabric Filter Baghouse
CO	0.10 lb./MMBtu	Proper Boiler Design and Operation
VOC	0.003 lb./MMBtu	Proper Boiler Design and Operation
Sulfuric Acid Mist	0.0054 lb./MMBtu	CFB Boiler with Limestone Injection, HAR FGD system, and Fabric Filter Baghouse
Mercury	1.5 lb./trillion Btu	CFB Boiler with Limestone Injection, HAR, and Fabric Filter Baghouse

Source: DEQ, 2006a; MMBtu = Million British Thermal Units

Other potential sources of air pollution from the generating facility include an auxiliary boiler, cooling tower, materials handling (e.g. coal, ash, and limestone), coal thawing shed heater, emergency coal storage pile, ash landfill, truck traffic, building heaters, fuel oil storage tank, emergency generator, and emergency fire water pump. SME would integrate mist eliminators into the cooling tower design, incorporate conveyor enclosures and baghouse dust collectors into the materials handling system design, use water and/or chemical dust suppression on the facility roadways, and use the emergency coal storage pile.

Overall estimated annual potential emissions of air pollutants of interest from all operations combined (including boiler and baghouse emissions, coal unloading and storage, etc.) at the proposed HGS are documented in Table 2-12.

The plant would require approximately 3,000 to 3,200 gallons per minute (4.32 to 4.61 million gallons per day or 4,850 to 5,170 acre-feet per year) of “make-up water”. The majority of make-up water would be used for cooling tower make-up due to the large evaporation, drift, and blowdown losses. A raw water tank would provide on-site storage for service water and cooling tower make-up usage. A coal burning power plant is a thermoelectric plant, and works by heating water in a boiler until it turns into steam. After the steam is used to spin the turbine-generator that produces electricity, it is sent to the condenser to be cooled back into water. Most of the water used in thermoelectric power generation is used in the condenser to cool the steam back into water. Then the condensed water is pumped back to the steam generator to become steam again while the cooling water is recycled through cooling ponds or towers.

Table 2-12. Estimated Potential Annual Emissions of Key Air Pollutants from Proposed HGS

Pollutant	Emissions in tons
Nitrogen Oxides (NOx)	944
Sulfur Dioxide (SO_2)	443
Carbon Monoxide (CO)	1177
Volatile Organic Compounds (VOCs)	38
Particulate Matter (PM)	376
Particulate Matter smaller than 10 microns (PM_{10})	366
Lead (Pb)	0.3
Mercury (Hg)	0.02

Source: DEQ, 2006a

Up to 811 gal/minute of wastewater would be discharged and would consist of concentrated river water and trace amounts of cooling tower water and boiler water treatment chemicals (DEQ, 2005a). SME plans to discharge this wastewater into the City of Great Falls wastewater treatment plant, thereby avoiding direct discharge of effluent into the Missouri River.

A hydrated ash reinjection or dry FGD system and pulse jet baghouse (fabric filter) would be installed "downstream" of the boiler to further reduce sulfur dioxide levels and remove fly ash in the flue gas stream. The baghouse collects the fly ash for disposal. Flue gas enters the baghouse through an inlet plenum, and the particulate matter is collected on the outside surface of the bags. Pulsating air is used to remove the ash from the filter media and discharge the ash to the baghouse hoppers. The fly ash would be removed from the baghouse and transported to a filter separator and then to a storage silo. Bed ash is removed from the fluidized bed and cooled as it is removed in the water cooled bed ash screw conveyors. Cooled bed ash would be discharged into a storage silo, which is sized for 3-day storage. From the silos, the fly ash and bed ash are mixed with wastewater and wastewater sludge to control dust and then trucked to a dedicated ash landfill, where the damp ash would solidify (SME, 2004b). The solid waste byproduct of the combustion process at the HGS would be approximately 225 tons of fly and bed ash that would require disposal in an environmentally acceptable manner on a daily basis (SME, 2005h).

After consulting with DEQ on solid waste management and examining two disposal options, SME plans to dispose of coal combustion byproduct within the confines of the rail loop adjacent to the generating facility. The area within the rail loop would be laid out in a rectangular grid consisting of nine parcels or cells totaling approximately 53 acres (21 ha). The grid would be two parcels wide and five parcels long. The nine roughly square 450 foot by 450 foot (137 by 137 m) cells could be opened one at a time on an "as needed" basis with an estimated byproduct storage capacity of approximately three years. The monofill facility would have a storage capacity for solid waste byproducts commensurate with the estimated life of the HGS – in excess of 35 years.

The rail loop and waste material landfill cells would be located on land that is relatively flat, as is typical for fuel unloading and related rail activities. Each cell would be excavated to a depth of

36 feet (11 m) and have an estimated combustion byproduct storage capacity of 36 months. The monofill cells would be designed as self-contained units with recompacted clay liners. As each cell was filled, a layer of compacted clay would be placed over the waste material. The final stage in the process, at an above-grade height of 22 feet (7 m), would be an evapo-transpiration cover and vegetation-sustaining layer of topsoil held in reserve from the process of opening an adjacent storage cell. All storage and reclamation materials necessary for this process can be found onsite.

In addition to the fly and bed ash there would be approximately 2.0 tons per day of equivalent solid waste byproduct produced by the raw water treatment facility. This slurry would consist of concentrated sediment naturally occurring in raw water taken from the Missouri River for use at HGS. The sediment concentrate resulting from the raw water treatment process would be injected into the fly ash and bed ash pug mills to control dusting. At this point the sediment concentrate would have a consistency well-suited for injection into the fly ash and bed ash pug mills.

The solid waste byproduct of the raw water treatment process would be deposited in the onsite monofill site where the fly and bed ash would be contained. The mixing of materials (bed or fly ash with the concentrated sediment in the pug mills below each ash storage silo) would result in a mixture which would set up like a light weight concrete material. The concentrated sediments would be encapsulated through this process. This material would be evenly spread throughout the monofill cells. The use of concentrated sediment would result in lower quantities of water needed for dust suppression within the pug mill and in the silo unloading processes.

Electricity from the operation of the proposed HGS would furnish the base load component of SME's proposed integrated power supply portfolio. However, under the Proposed Action, SME and its member cooperatives would continue to purchase power from WAPA as well as continue to invest in energy conservation and efficiency, as mandated since 1997 by the State of Montana in Senate Bill 390. In addition, SME proposes to purchase and/or generate an Environmentally Preferred Product, probably wind energy. As discussed below, SME's Board has expressed its intention to construct four 1.5-MW wind turbines on the Salem site on a gentle ridge within the property that would be acquired for the HGS. In addition to generating a small amount of intermittent power, these proposed turbines would enable SME engineers to gain on-the-ground experience integrating wind as part of the power supply portfolio.

2.2.2.3 Wind Turbines

One additional element of the Proposed Action that would take place at the Salem site is the construction and operation of a wind generation project having an aggregate capacity of approximately 6 MW distributed between a maximum of four individual wind turbine generator (WTG) sites. Although SME has received Clean Renewable Energy Bonds (CREBs) funding for the construction of these structures (that is, they are not part of the RD loan application), they are included as a part of the Proposed Action. Wind energy was discussed at some length in Section 2.1.3.1 in the context of why it alone could not meet the entire benefits, purpose and need for the project, and that discussion will not be repeated here. A brief description of the proposed facilities will suffice.

Figure 2-30. 1.5-MW GE Wind Turbines at Judith Gap, Montana

Wind towers would be tubular multi-sectional, having a base diameter of approximately 18 feet (5.5 m) and be erected onsite. Towers are anticipated to have a height of 262 feet (80 m) at the rotor. The wind turbine is expected to have three blades, with an overall diameter of 250-270 feet (77-82.5 m) or radius of 125-135 feet (38-41 m). Thus, when a rotating blade is in the upright position, its tip would rise approximately 387-397 feet (118-121 m) above the ground surface. The tower and turbines would be erected on a spread footing foundation approximately 48 feet (15 m) across and up to four feet (1.2 m) thick; a volume of 240 cubic yards (183 cubic meters) of concrete with 40,000 lbs. (18,000 kg) of reinforcing steel would be needed for each foundation (ECI, 2006). The overall appearance of the wind machines would be very similar to that shown in Figure 2-30 at Judith Gap, MT.

Development of the HGS Wind Project would require approximately 100 acres (40 ha) to be occupied by up to four wind machines. The location of these machines would be generally north -northwest of the HGS Coal-Fired Plant site (Figure 2-31). Elevation above sea level for the wind turbine tower foundations would be approximately 3,280 feet (1,000 m). Wind towers would be upwind from the HGS coal-fired plant facilities, oriented to form a single string of turbines running northwest-southeast in order to capture energy from the prevailing westerly and southwest winds. Spacing between wind turbines would be approximately 800 feet (240 m). Final siting for the WTGs would need to be coordinated with placement of the 230-kV transmission lines, rail spur and HGS main access road (ECI, 2006).

Excavation and grading would be required at each WTG location for foundation placement, as well as a temporary crane pad for tower erection. The total area of site disturbance for each tower is estimated at approximately 1.1 acres (0.4 ha). A portion of the excavated native soil materials would be used to establish natural drainage away from the turbine tower foundation. Additional soils disturbance would occur for installation of high voltage underground cable (collection system), communications cable and the electrical grounding system between the HGS Switchyard and WTG locations. A total of approximately 3,300 feet (1,000 m) of excavated trench, typically three feet (0.9 m) wide by four feet (1.2 m) deep, would be required.

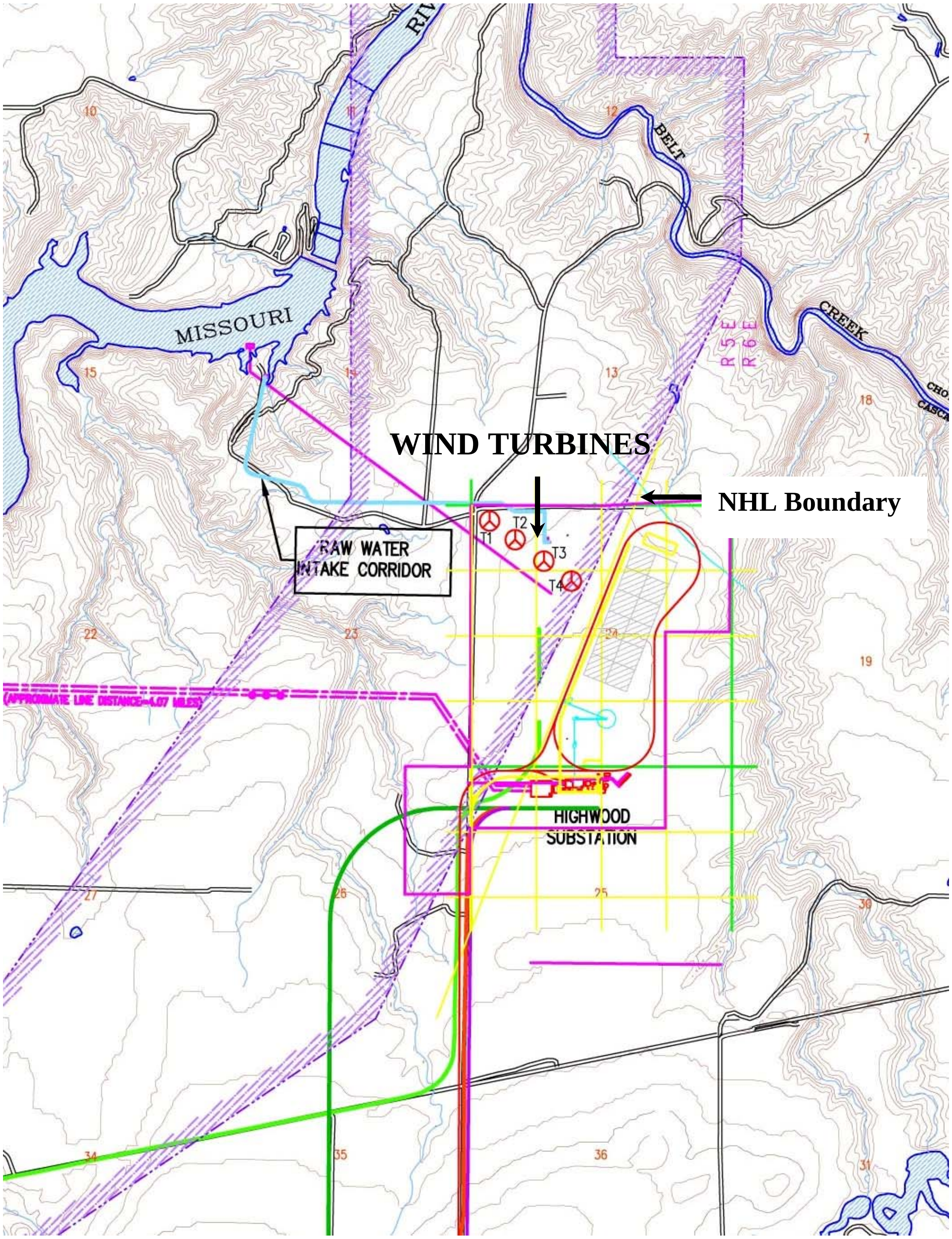


Figure 2-31. Preliminary HGS Wind Turbine Site Plan

Ongoing operation and maintenance would require construction of approximately 2,200 lineal feet (670 m) of access roads. Road construction impacts would be reasonably small considering the relatively minor change in elevation between WTG locations, the HGS plant site and existing county road. Access road construction would be limited to placement of pit run and final road base gradation materials to establish a 25-foot (8 m) wide drivable surface with elevations of 12 inches (0.3 m) or more above natural grade, or as otherwise required to interface with an improved primary plant access road. Culverts to re-establish natural drainage would be utilized where required; in addition, riprap and flow diversion devices would be specified as required for erosion protection. Top soils removed at the start of construction would be spread adjacent to completed roadways and disturbed areas would be reseeded with natural vegetation (ECI, 2006).

Integration of wind generation into a wholesale power supply portfolio requires a proper balance between the operating characteristics of base load generation, power purchase agreement flexibility and cost of service objectives. Purchasing or generating wind power has an associated expense that must be addressed as the wholesale power supplier meets its obligation to supply a reliable, affordable and balanced supply of wholesale electric energy and related services to its member systems. The integration of wind into a power supply portfolio can be challenging and the “all in” costs related to this resource must be objectively considered in order to accurately reflect the contribution this resource will make to supply portfolio pricing (SME, 2005c).

When compared to other generation technologies, wind power has a number of unique operating characteristics that must be included in an objective estimate of the cost of wind generation. Wind generation is uncertain, variable and cannot be dispatched. Wind power facilities generate electricity only when the wind is blowing, with production facility output very dependent on wind speed. Unfortunately, wind speed cannot be predicted with any degree of accuracy over a predetermined period of time. Therefore, to “firm” wind power for sale into the market, or to base load dispatch wind power directly into the system grid in a predetermined load control area, requires a dedicated source of operating and spinning reserve capacity equal to the production ability of the wind resource. Absent a commensurate

“Firming” and “Load Control Area”

The term **"<u>firming</u>"** in this instance describes the process of having a base load generation resource in "spinning reserve" – ready to cover load with no more than a one-hour notice. Firming is necessary in the case of wind generation because the amount of energy produced at these facilities can (and does) vary as a function of the availability of wind. If wind generation has been earmarked to cover a particular load, the entity relying on that resource to cover load must have an alternate source of generation to cover the load when the wind does not blow.

"<u>Load control area</u>" is a defined portion of the electrical grid where an entity (generally the predominant owner of the transmission facilities in that area) is responsible for ensuring that for every hour of the year (8,760 hours) they will balance the demand for electricity with supply of electric energy. The task is accomplished by ensuring that the electric energy that is being produced/purchased by load serving entities (such as SME) with load in that particular geographic area, have adequate generation on line or have scheduled energy for delivery into that area adequate to cover the load they serve. In the event there is discrepancy between load and supply, the load control area services provider will go to the open market and purchase the energy requirement shortfall and bill the entity that was short on supply for all costs associated with that transaction. If a load serving entity has more energy delivered than they have load, the load control area services provider will sell the surplus and return the proceeds to the supplier that over delivered the revenue from that transaction – less FERC-approved charges. The concept of load/supply reconciliation is referred to as balancing the system when in energy imbalance.

level of reserve capacity, wind power does not meet the basic requirements of a dispatchable source of generation, and simply ignoring the associated cost of "firming" renders any economic comparison of wind power to traditional base load generation fundamentally flawed.

The uncertainty and variability of wind power also presents operational issues for the system dispatch operator. The system dispatch operator has the responsibility to determine how much generation must be "on line" to meet the forecasted system load requirement on an hourly basis. This scheduling activity typically begins a full day in advance, with anticipated system load and generation capacity being "balanced" on an hourly basis.

In a system comprised of both wind and conventional base load generation, the dispatch operator will determine on an "hour ahead basis" if there is sufficient generation capacity on line to meet the system load requirements – with and without the use of wind generation. If additional generation resources are needed, the system dispatch operator is responsible for acquiring generation capacity necessary to meet system load requirements. Typically, the system dispatcher would attempt to meet these requirements with purchases from available lowest-cost generation resources located within the load control area that the dispatch operator is responsible for keeping in "balance." The process of seeking, purchasing and dispatching supplemental generation on the basis of cost is referred to as "economic dispatch."

Once wind and other generation resources are brought on line, the system dispatch operator would have the responsibility to maintain the "match" between system load requirements and generation supply. If the system is in balance – implying that generation resources have a constant output that matches load control area requirements – the electric system is said to be in "steady state." However, should the wind suddenly or unexpectedly decrease or stop, the contribution wind capacity was making to the system's generation requirements would decrease accordingly and the system operator would have to readjust the mix of generation resources and compensate for this loss of generation capacity.

The need for additional generation may be met with capacity owned by the load control area provider/operator or by making purchases of generation capacity from resources willing to sell capacity at the prevailing market rate. It should be noted that the purchase of generation capacity on short notice could be very costly. There is a significant cost associated with starting additional generators and bringing them on line with short notice to cover the imbalance between system load requirements and on-line generation capacity.

Recently, there has been considerable discussion on the relative cost of wind generation. Based on an analysis of current Mid-Columbia energy market prices, it appears as though the price being quoted for the cost of wind generation may not represent the "all in" cost of this resource. The following calculation (Table 2-13) represents the underlying economics associated with determining the "all in" cost of wind generation on a specific date – including "firming."

Table 2-13 demonstrates that while the $35/MWh (after production tax credit) cost of wind power is highly competitive with fossil fuel energy sources, the "penalty" of its intermittency is a higher overall price ($66.24/MWh) due to having to purchase costly spinning reserve and power to fill in when the wind is not blowing.

Table 2-13. Wind Power Firming Cost

Assume:			
Generation Form	Cost	Unit of Energy	Comments
Wind Power	$35	/MWhr	After production tax credits
Purchased Power	$84	/MWhr	Average cost for firm on and off peak at the Mid-Columbia Electricity Index on October 15, 2005
Assume the wind power is available 36% of the time, which is a one-hour increment, and for each hour the balance of the power will be supplied by the Purchased Power Component.			
Wind Power Component	$12.60		
Purchase Power Component	$53.64		
Total Power Cost	**$66.24 /MWhr**		

Cost-effective generation resource management is a multidimensional task complicated by load variation, generation availability and cost of production. System load requirements can vary greatly by time of the day, day of the week and season. This load requirement dynamic does not match particularly well with the lack of predictability inherent in wind generation capacity. Central station electric power cannot be stored in quantities sufficient in size to cover an appreciable level of fluctuation in system load requirements. Essentially, the electric grid operates as a large synchronous machine whereby electricity must be produced and consumed on an instantaneous basis.

The HGS would be the only dispatchable source of generation in the entire SME system. The HGS unit would have, relatively speaking, limited load following ability. When operating at or above its minimum load level, the HGS is expected to be able to increase load or “ramp up” at approximately 3 MW to 10 MW per minute. For comparison purposes, a similar sized gas-fired combined cycle plant would be able to ramp up at approximately 10 MW to 15 MW per minute to cover system imbalances – but at a much higher cost.

During the time that the unit is ramping up or down to meet a variance in load, the unit’s performance (i.e., heat rate) suffers and its emissions rates increase. Variations in a generating unit’s operating characteristics are due to the “flywheel” effect of the generating unit as it responds to demands from its operator to alter energy production. As the generating unit’s “moment of inertia” must be overcome relative to variations in energy production, unit operating efficiencies decline. When a particular generating unit is called upon to increase energy production output, operating efficiency may decline to the point that additional sources of generation are needed until the primary generating unit is able to respond to contemporary load requirements. The limitations of the flywheel effect and overcoming a moment of inertia are also true of wind power. The period of time when generating units are the most efficient is when they are operating at “steady state” – which means the generating unit no longer needs to overcome the flywheel effect and the system load requirements and generation resources are in balance for a specific load control area.

Likewise, should the wind suddenly or unexpectedly pick up, the wind power production facilities would “cut-in” and begin producing electricity. Under this scenario, the system

dispatch operator would reduce the output from the HGS (or some other dispatchable source of base load capacity) in order to allow for the additional energy from the wind power facilities. This rapid curtailment in base load capacity may also create problems in the form of performance degradation and higher emissions rates. Once again, this mild form of system instability is due to the inherent design characteristics of dispatchable base load generation. Throughout the period of base load generation "ramp down," more energy is used at any load point than would be used at that same point under steady state operation. This phenomenon results in increased emissions and performance penalties as compared to the steady state condition where optimum efficiency and lowest emissions are possible.

Typically, natural gas-fired combined cycle facilities are looked to as a source of generation reserves well suited to satisfy system production/load imbalances in a specific load control area. However, recent increases in the price of natural gas have rendered a wind/combined cycle plant combination a very expensive source of base load generation. In fact, when viewed in the context of the added pressure natural gas-fired generation has had on the supply and price of natural gas, an unintended consequence of this arrangement has been an inadvertent increase in the cost of natural gas. With natural gas serving as a primary source for home heating in much of SME's service territory, fixed income and low income consumers are negatively impacted with increased cost for home heating and a higher cost for electricity that would more cost-effectively be met through SME's contemplated supply portfolio.

The challenge of maintaining "steady state" is significantly affected by the introduction of generation resources dispatchable only on a non-firm basis. A base-load, fully dispatchable source of generation will always be needed to serve as the "regulating" energy production facility governing the match between production and system load requirements. The base-load generating unit providing system regulation will utilize its governor control system to determine generation requirements necessary to match load control area energy requirements with generation capacity. This fundamental system operating requirement cannot be satisfied by a wind power source of generation that is not fully dispatchable on a predetermined basis.

There are two distinct load fluctuation patterns realized from the utilization of wind power. The first is the instantaneous fluctuation of power caused by the variability in wind power. These swings occur over fractions of a second. The second fluctuation occurs over a longer period of time, which can be fractions of a minute to fractions of an hour. Added to these fluctuations are the changing system load requirements. In order to limit the impacts of fuel costs, increased emissions and additional system imbalance costs, SME believes that it is in the best interests of its member/owners to limit the percentage of its power generation portfolio from wind generation to a relatively low amount, in a range of 2-3 percent of the system load. This is generally considered to be in the range of the control system response of the boiler, turbine, and generator controls for a coal-fired unit. Under this scenario, the uncertain and/or unplanned startup and shutdown of wind generation will have little effect on the overall performance of the proposed power plant. It may be that, in time, reliance on wind or other sources of renewable generation could be increased, but at this time wind is still not a proven economically dispatchable source of base load generation.

The Montana Legislature has set a goal of 15 percent for the renewable resource portion for power supply portfolios. The requirement to meet this objective will ramp in over time with the

ultimate goal of 15 percent beginning in the year 2015. Although not specifically required to do so by the recent action of the Montana Legislature, SME is focused on integrating wind power into its supply portfolio. To ensure the highest level of operating flexibility of the contemplated HGS, SME is installing a modest amount of wind generation (6 MW) to test the value of this resource. SME will also consider power purchase agreements with qualified wind power producers operating in larger load control areas as an additional source of renewable energy. A wind resource-based power purchase agreement would enable SME to structure the integration of wind resources into the supply mix as a "firm" resource – complete with operating and spinning reserves.

SME may eventually decide to expand on its test program to the extent where it would own, operate and maintain additional wind generation. However, to properly place this activity in perspective would require a detailed analysis of the total cost of this resource as experienced by the test program is implemented. This analysis would require extensive, all-inclusive economic modeling of the costs associated with project development, construction, reserves (both operating and spinning), economic dispatch, transmission capacity and other costs associated with the contemplated test facility.

2.2.2.4 Connected Actions

Projects of this scale and scope always entail “connected actions”, that is, other actions, projects, or processes that are linked in some way to or are dependent on the Proposed Action. Connected actions are influenced by the Proposed Action; either they would not occur without the Proposed Action or their magnitude, nature, location or timing are affected by the Proposed Action.

The coal and limestone to be combusted in the CFB boiler at the proposed HGS would be purchased and transported from other existing companies conducting ongoing operations at existing mines and quarries and are therefore not part of the Proposed Action per se. Neither SME nor the suppliers in question would be opening new extractive facilities to supply the raw materials used in the proposed HGS. However, by using raw materials from the facilities in question, SME may contribute to expanded operations and would be contributing incrementally to the impacts associated with mining and quarrying coal and limestone, respectively. In the case of coal, which would be used in much larger quantities than limestone (45 times as much, by weight) these impacts have already been addressed and mitigated in Environmental Impact Statements for the Spring Creek and Decker coal mines (USGS-MDSL, 1977; USGS-MDSL, 1979; MDSL, 1980). These EISs are hereby incorporated by reference into the present EIS.

In 2004, the Spring Creek Mine, operated by the Spring Creek Coal Company in southeastern Montana’s Powder River Basin, was the 13th largest coal mine in the United States, producing approximately 12.1 million tons of coal. The Decker Mine nearby, operated by the Decker Coal Company, was the 18th largest coal mine in the U.S. (by tonnage produced), with 2004 production of 8.2 million tons. They were the second and third largest coal mines in Montana, respectively (EIA, 2004b). Projected coal consumption of 1,314,000 tons per year for the proposed HGS would therefore represent about 9 percent of the Spring Creek Mine’s annual production or about 14 percent of Decker’s.

Figure 2-32. Graymont's Indian Creek Lime Plant near Townsend, MT

SME would purchase approximately 3,888 tons per year of limestone from Graymont's Indian Creek lime plant to be injected in the CFB boiler and used as bed material. The Indian Creek plant (Figure 2-32) is located near Townsend, MT, just north of the Limestone Hills. It produces lime in two coal/coke fired preheater kilns and is equipped with lime sizing and storage facilities as well as a hydrator capable of producing 300 tons of hydrated lime per day (Graymont, 2005). Operation of this facility is regulated by DEQ Operating Permit #00105 and is not addressed here.

The plant's limestone quarry is on the south side of Indian Creek. High quality limestone from the quarry is trucked to a crushing plant where it is sized and conveyed to a large storage pile next to the preheater kilns. Bulk truck loading facilities are provided at the plant site (Graymont, 2005); HGS limestone deliveries from the Indian Creek plant would be made by truck.

As to other actions described previously, including constructing and operating transmission line interconnections, the railroad spur, and water and wastewater pipelines, as well as transporting coal to the HGS in unit trains along the rail spur, while these are integral to the Proposed Action itself, they are not considered connected actions but rather components of the overall Proposed Action.

2.2.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

The Industrial Park site is located in the Southern half of Section 30, Township 21 North, Range 4 East. It is just east of Highway 87, about ¾ mile (1.2 km) north of the Missouri River and ½ mile (0.8 km) east of a mobile home park (see Figure 2-24). The City of Great Falls has designated this site as the Central Montana Agricultural and Technology Park, that is, as an industrial park. Construction and operation of the 250-MW, CFB coal-fired power plant at the Industrial Park site would be the same as described in section 2.2.2 for the Salem site, except for the differences described below. Figure 2-33 displays the rough layout of the Industrial Park site and Figures 2-34 and 2-35 depict scenes from the site.

Eight miles (13 km) of new track and railroad bed would be needed, slightly more than the distance for the Salem site. The rail spur would start north of the Missouri River and travel north and west to the plant site. A 4.5-mile (7.2-km) long pipeline (compared to less than three miles for the Salem site) would be needed to transport make-up water from an intake structure on the Missouri River to the plant. Precise locations of transmission line corridors have not yet been determined, though it is likely that one transmission line would go to the Great Falls Switchyard, which is about 5.5 miles east of the Industrial Park site. A second line of 18 miles in length would likely be built to a switchyard installed on the Great Falls to Ovando line. The specific

rights-of-way for potable water and wastewater lines have been selected, and are 1.5 and two miles in length, respectively, which are shorter than for the Salem site.

Construction at the Industrial Park site would take the same length of time as at the Salem site, approximately three and a half years, and the workforce would be about the same size – averaging between 300 and 400 workers at any one time with an estimated peak construction workforce approaching 550 (SME, 2005j).

The proposed 250-MW (net) generating station would include the same equipment and component parts, would be operated identically and would consume the same quantities of raw materials as in the Proposed Action.

Disposal of fly and bed ash would not take place onsite at the Industrial Park site, because of the smaller area. Instead, ash would be shipped away for disposal in an approved landfill, for reuse as an industrial byproduct, or both.

SME has not committed to building and operating wind turbines at the Industrial Park site. However, it would continue to purchase power from WAPA, purchase 1 MW of Environmentally Preferred Power, and invest a minimum of 2.4 percent of annual retail sales in energy efficiency and conservation per Montana Senate Bill 390.

The connected actions of mining coal and quarrying limestone would be the same as in the Proposed Action.

2.2.4 AGENCIES' PREFERRED ALTERNATIVE

RD and DEQ's preferred alternative is the Proposed Action – the Highwood Generating Station at the Salem site.

2.2.5 COMPARISON OF ALTERNATIVES

Table 2-14 on the following pages is a matrix comparing the potential impacts by resource topic of each of the alternatives analyzed fully in this EIS.

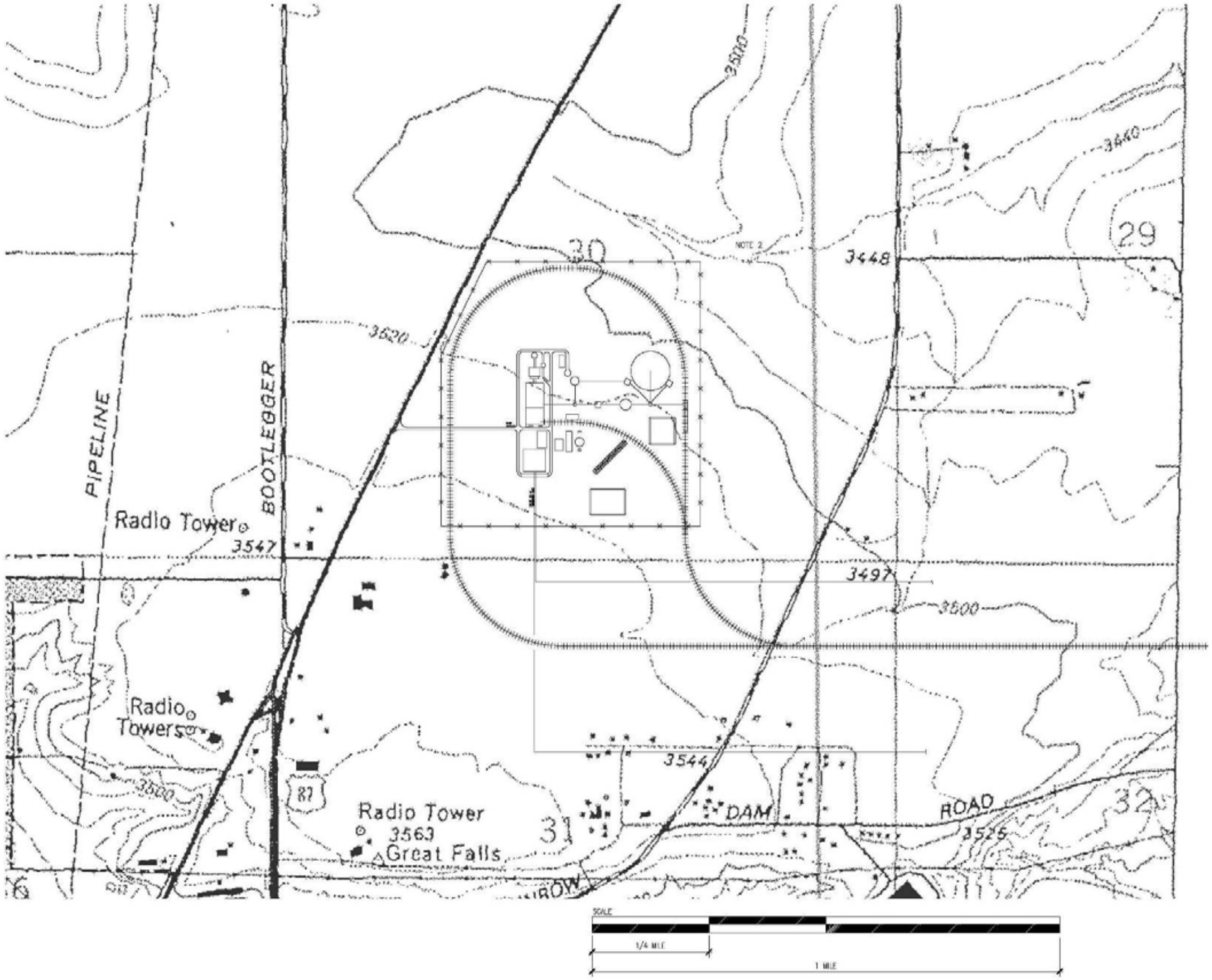


Figure 2-33. Preliminary Layout of the Industrial Park Site (Central Montana Agricultural and Technology Park)

Figure 2-34. <u>September 2005</u> View of the Industrial Park Site

Figure 2-35. <u>September 2005</u> View from the Industrial Park Site West Toward Suburban Subdivision North of Great Falls

Table 2-14. Comparison of Direct, Indirect, and Cumulative Environmental Impacts of Alternatives

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Soils, Topography, and Geology	▪ No impacts on the topography or the geology of the Salem or Industrial sites. ▪ Negligible to minor, long-term adverse impacts on soils would continue from existing land use practices.	▪ Negligible to minor impacts on topography and geology. ▪ Soils impacts from construction activities would have a moderate magnitude, medium-term duration, medium extent, and probable likelihood. ▪ Overall rating from construction impacts adverse and non-significant. ▪ Impacts from operation of the waste monofill would be adverse but non-significant, and of minor magnitude, long-term duration, small extent, and probable likelihood. ▪ Overall impacts on soil at the Salem site would be adverse and <u>most likely non-significant.</u>	▪ Negligible to minor impacts on topography and geology. ▪ Soils impacts from construction activities would have a minor magnitude, medium-term duration, medium extent, and probable likelihood. ▪ Overall rating from construction impacts adverse and non-significant. ▪ Operation-related impacts on soil resources would be adverse but non-significant, and of minor magnitude, short-term duration, small extent, and possible likelihood. ▪ Overall impact on soil at the alternative site would be adverse and non-significant. Impacts at an alternative ash disposal site are unknown and site-dependent.
Water Resources	▪ Would not significantly, adversely affect water resources at or near the Salem Site or the Industrial Park. ▪ Negligible to minor, long-term adverse impacts on water resources would continue from existing agricultural land uses. ▪ Could potentially contribute	▪ Construction of the HGS would likely entail increased storm water runoff carrying sediment and contamination loads into surface water, and the potential for contamination from construction equipment and activities infiltrating area soils and percolating down into	▪ Construction of the HGS would likely entail increased storm water runoff carrying sediment and contamination loads into surface water, and the potential for contamination from construction equipment and activities infiltrating area soils and percolating down into

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Water Resources (continued)	indirectly and cumulatively to water resource impacts at the sites of other generation sources from which power is purchased.	the groundwater. Impacts to water quality would be mitigated (reduced but not entirely eliminated) through BMPs. ▪ Negligible to minor impact on wetlands and floodplains. ▪ Water withdrawals from the Missouri River for HGS operation would reduce flows by 0.31% in a worst-case scenario. ▪ Effluent would be discharged to City of Great Falls sewage treatment system rather than directly into the Missouri River after on-site treatment. ▪ Impacts from power plant operation would be of minor magnitude, long term duration, medium extent, and probable likelihood. ▪ Overall rating for impacts on water resources from the operation phase of the power plant would be adverse and non-significant.	the groundwater. Impacts to water quality would be mitigated (reduced but not entirely eliminated) through BMPs. ▪ Negligible to minor impact on wetlands and floodplains. ▪ Water withdrawals from the Missouri River for HGS operation would reduce flows by 0.31% in a worst-case scenario. ▪ Effluent would be discharged to City of Great Falls sewage treatment system rather than directly into the Missouri River after on-site treatment. ▪ Impacts from power plant operation would be of minor magnitude, long term duration, medium extent, and probable likelihood. ▪ Overall rating for impacts on water resources from the operation phase of the power plant would be adverse and non-significant.
Air Quality	▪ Would not result in any direct air quality impacts on either the Salem or Industrial Park sites. ▪ Would contribute indirectly and cumulatively to air quality impacts at those power plants from which SME would purchase electricity,	▪ Short-term, minor to moderate degradation of local air quality from construction activities. ▪ Long-term minor to moderate degradation of local air quality from HGS operations. ▪ Long-term minor impacts on	▪ Short-term, minor to moderate degradation of local air quality from construction activities. ▪ Long-term minor to moderate degradation of local air quality from HGS operations. ▪ Long-term minor impacts on

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Air Quality (continued)	although these impacts cannot be specified.	sensitive species from criteria pollutant emissions and/or trace element deposition. ▪ Off-site impacts on PSD Class I increments and AQRVs (regional haze and acid deposition) ranging from negligible to moderate in intensity. ▪ Annual mercury emissions from the HGS would be approximately 34.5 lbs. (15.7 kg), constituting a minor incremental contribution to cumulative state, national, and global mercury emissions. State and national mercury emissions are declining due to new rules and controls; global emissions are still rising. HGS Hg emissions are unlikely to present unacceptable health risks to humans or wildlife locally or in the state. ▪ Minor, incremental contribution to accumulation of greenhouse gases in the atmosphere, which scientists believe is forcing climate change. ▪ Overall air quality impacts would be adverse and most likely non-significant.	sensitive species from criteria pollutant emissions and/or trace element deposition. ▪ Off-site impacts on PSD Class I increments and AQRVs (regional haze and acid deposition) ranging from negligible to moderate in intensity. ▪ Annual mercury emissions from the HGS would be approximately 34.5 lbs. (15.7 kg), constituting a minor incremental contribution to cumulative state, national, and global mercury emissions. State and national mercury emissions are declining due to new rules and controls; global emissions are still rising. HGS Hg emissions are unlikely present unacceptable health risks to humans or wildlife locally or in the state. ▪ Minor, incremental contribution to accumulation of greenhouse gases in the atmosphere, which scientists believe is forcing climate change. ▪ Overall air quality impacts would be adverse and most likely non-significant.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Biological Resources	▪ No direct impacts on biological resources at either the Salem or Industrial Park sites. ▪ Could contribute indirectly and cumulatively to impacts on flora and fauna from those power plants from which SME would purchase electricity, although these impacts cannot be specified.	▪ Temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment. ▪ Eliminate potential habitats, but unlikely to adversely affect, state-listed species of concern from permanent removal of vegetation. ▪ Short-term harm to wildlife & vegetation by degrading air quality. ▪ Short-term harm to aquatic biota from degraded water quality. ▪ Long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on access road. ▪ Increased mortality to birds and bats from blade strikes on wind turbines. ▪ Temporarily disturb habitats along water pipeline routes during construction activities. ▪ Temporarily disturb wetland habitats for installation of water intake. ▪ In sum, impacts on biological resources would be of minor magnitude, long-term duration, small extent and probable likelihood. ▪ Overall biological resources impact would be adverse and non-significant.	▪ Temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment. ▪ Eliminate potential habitats, but unlikely to adversely affect, state-listed species of concern from permanent removal of vegetation. ▪ Short-term harm to wildlife & vegetation by degrading air quality. ▪ Temporarily disturb habitat along water pipeline routes during construction activities. ▪ Temporarily or permanently disturb wetland habitats for installation of water intake. ▪ In sum, impacts on biological resources would be of minor magnitude, long-term duration, small extent and probable likelihood. ▪ Overall biological resources impact would be adverse and non-significant.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Acoustic Environment	▪ No direct noise impacts on either the Salem or Industrial Park sites. ▪ Would contribute indirectly to noise impacts at other plants from which SME would purchase electricity.	▪ Noise levels from the operation of the HGS, including intermittent noise sources, would be audible for several miles from the site. ▪ Predicted noise levels from HGS and wind turbines are equal to or less than the EPA guideline at receptors near the Salem site. ▪ Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 3.1 miles (5 km) from the Salem site. ▪ At all receptor locations, the power plant and wind turbine noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA Ldn 55 dBA guideline. ▪ <u>According to National Park Service policy, noise impacts on the NHL would be significant because of the degradation to natural ambient sounds.</u> ▪ Overall noise impacts would be minor, localized and long-term; <u>while impacts on Great Falls and Salem area residents would most likely be non-significant, there would be a significant adverse</u>	▪ Noise levels from the operation of the HGS, including intermittent noise sources, would be audible for several miles from the site. ▪ Predicted noise levels are equal to or less than the EPA guideline at the receptor locations around the Industrial Park site. ▪ Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approx. 1.2 miles (1.9 km) from the Industrial Park site. ▪ At all receptor locations, the power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA Ldn 55 dBA guideline. ▪ Overall noise impacts would be minor, localized, and long-term; while impacts would most likely be non-significant, there is some potential for the impacts to become significant.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Acoustic Environment (continued)		impact on the acoustical environment of the Great Falls Portage National Historic Landmark.	
Recreation	▪ No direct impacts on recreation facilities or opportunities in the area. ▪ Would contribute indirectly to recreation impacts associated with those generating stations from which SME would purchase electricity.	▪ Construction and operation of the HGS would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. ▪ The Lewis and Clark staging area historic site would be impacted by the Proposed Action. ▪ Generally, impacts on recreation would be of minor magnitude, long-term duration, small extent, and probable likelihood. ▪ Overall impacts on recreation would be adverse and non-significant.	▪ Construction and operation of the SME power plant at the alternate Industrial Park site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. ▪ Upper portions of the proposed generating station would be visible to park users and recreationists along the Missouri River in Great Falls. ▪ Overall impacts on recreation would be adverse and non-significant.
Cultural Resources	▪ No direct impacts on cultural resources in the area. ▪ Could potentially contribute indirectly to cultural resources impacts associated with those generating stations from which SME would purchase electricity.	▪ Adversely affect Great Falls Portage NHL from site preparation, staging, construction, maintenance, operations, and connected actions associate with power plant, water lines, transmission lines, rail supply lines. ▪ Other cultural properties within the APE would not be affected by the proposed undertaking.	▪ Would likely have no effect on cultural resources due to their apparent absence from the Industrial Park site. ▪ It appears that no TCPs would be affected. ▪ Constructing transmission lines, water supply and wastewater lines could potentially affect undiscovered cultural resources.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Cultural Resources (continued)		▪ It appears that no TCPs would be affected. ▪ In sum, cultural resources impact would be of major magnitude, long-term duration, medium or localized extent, and probable likelihood. ▪ Overall impact would be adverse and significant; significance of impacts can be reduced but not eliminated by proposed mitigation, including moving most of the facilities to just outside the NHL.	▪ Overall impact likely to be negligible to minor.
Visual Resources	▪ No direct impacts on visual resources in the area. ▪ Could potentially contribute indirectly and incrementally to visual resources impacts associated with those power sources from which SME would purchase electricity.	▪ The HGS and wind turbines would have scenic impacts of major magnitude, long-term duration, small extent, and high probability. ▪ While the HGS and wind turbines would clearly diminish scenic values within the NHL, they would not eliminate them; certain views would remain unaffected. ▪ Overall rating for visual impacts from the Proposed Action would be adverse and significant; significance of impacts can be reduced but not eliminated by proposed mitigation, including moving most of the facilities to just outside the NHL, landscaping, and compatible earth-tone color schemes.	▪ Would have scenic impacts of moderate magnitude, long-term duration, medium or localized extent, and high probability. ▪ Overall rating for visual impacts from the alternative Industrial Park site would be adverse but non-significant.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Transportation	▪ Would not contribute directly to transportation impacts at either the Salem or Industrial Park sites. ▪ Would be contributing indirectly to ongoing transportation impacts at existing generating stations in the region.	▪ Construction-related impacts on traffic would be of moderate magnitude, medium-term duration, small extent, and probable likelihood; according to Montana Department of Transportation criteria, short-term construction-related impacts would be significantly adverse. ▪ Over the long term, during operation of the proposed HGS, impacts on road, rail and air transportation would be generally negligible.	▪ Construction-related impacts on traffic would be of moderate magnitude, medium-term duration, small extent, and probable likelihood; according to Montana Department of Transportation criteria, short-term construction-related impacts would be significantly adverse. ▪ Over the long term, during operation of the proposed Industrial Park facility, impacts on road, rail and air transportation would be generally negligible.
Farmland and Land Use	▪ Would not adversely affect or alter existing land uses at or near the Salem Site or the Industrial Park. ▪ The Salem Site would continue to be maintained in agricultural production and the Industrial Site would continue to be open space. ▪ Could potentially contribute indirectly to impacts on farmland and land use related to other generation sources.	▪ Construction of a power plant at the Salem site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. ▪ No homesteads or residences would be displaced. ▪ In the context of the amount of quality farmland in other areas of Cascade County, the conversion of farmland to developed land required for the plant would be a minor magnitude, long-term (permanent) duration, medium extent, and probable likelihood.	▪ Construction of a power plant at the Industrial Park site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. ▪ No homesteads or residences would be displaced. ▪ In the context of the amount of quality farmland in other areas of Cascade County, the conversion of farmland to developed land required for the plant would be a minor magnitude, long-term (permanent) duration, medium extent, and probable likelihood.

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Farmland and Land Use (continued)		▪ Overall rating for impacts on land use from the construction phase of the power plant would be adverse and non-significant ▪ Operation of the power plant at the Salem Site would cause no additional direct impacts to land use or farmland. ▪ However, the influence and impacts of the power plant and its associated support facilities could indirectly influence land uses on adjoining or nearby properties in the vicinity of the site. ▪ Development of the Salem Site may reduce market values of nearby rural, agricultural land, affecting sales of those lands. Property values are less likely to be affected, but if they are reduced then there would be repercussions on land assessments and property taxes. ▪ Overall rating for impacts at Salem would be adverse and non-significant, but with some potential for the impacts to become significant.	▪ Overall rating for impacts on land use from the construction phase of the power plant would be adverse and non-significant. ▪ Operation of the power plant at the Industrial Park site would cause no additional direct impacts to land use or farmland. ▪ Indirectly, however, the greater proximity of residential areas and other businesses to the Industrial Park site could potentially create more land use conflicts than at the Salem Site. ▪ Development of the Industrial Park Site may reduce the market values of nearby agricultural or residential land, affecting sales of those lands. Property values are less likely to be affected, but if they are reduced then there would be repercussions on land assessments and property taxes. ▪ The impacts on land use from the operation of a power plant at the Industrial Park Site would be minor magnitude, long-term duration, medium extent, and possible likelihood. ▪ Overall rating for impacts at the Industrial Park site would be adverse and non-significant, but

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
			with some potential for the impacts to become significant.
Waste Management	▪ Would not create any waste management issues on either the Salem or Industrial Site, as no waste would be generated at the sites. ▪ By purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to waste management impacts associated with existing or new generating stations in or outside the region.	▪ Construction-related impacts on waste management would be of minor magnitude, medium-term duration, small extent, and probable likelihood. ▪ Ash and water treatment system byproducts would be disposed of in an onsite monofill which would be managed with appropriate environmental controls, including groundwater monitoring. ▪ Operation-related impacts would be of moderate magnitude, long-term duration, medium extent, and probable likelihood. ▪ Overall waste management impacts would likely be non-significant, but with some potential to become significant.	▪ Construction-related impacts on waste management would be of minor magnitude, medium-term duration, small extent, and probable likelihood. ▪ All non-hazardous waste generated during operation of the power plant, including ash, would be disposed of at the HPSL. ▪ Operation-related impacts on waste management for the Industrial Site would be of minor to moderate magnitude, long-term duration, small extent, and probable likelihood. ▪ Overall waste management impacts would likely be non-significant, but with some potential to become significant.
Human Health and Safety	▪ Would not create any notable risks to human health and safety at, or because of, the sites. ▪ By purchasing power from other generation sources, SME would be contributing indirectly to ongoing human health and safety impacts at	▪ Construction-related impacts at the Salem site would be of minor magnitude, medium-term duration, small extent, and probable likelihood. ▪ Operation-related impacts on human health and safety for the Salem site	▪ Construction-related impacts at the Industrial Park site would be of minor magnitude, medium-term duration, small extent, and probable likelihood. ▪ Operation-related impacts on human health and safety for the alternative

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
	different generating stations in the region.	would be of minor magnitude, long-term duration, medium extent, and probable likelihood. ▪ Overall health and safety impacts of the plant would be adverse and most likely non-significant.	site would be of minor magnitude, long-term duration, medium extent, and probable likelihood. ▪ Overall health and safety impacts of the plant would be adverse and most likely non-significant.
Socioeconomic Environment	▪ Due to the higher electric rates it would likely lead to for SME's members and consumers, the socioeconomic impacts from the No Action Alternative would be potentially significant and adverse.	▪ Construction of the HGS would have a moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. ▪ During the long term operation of the HGS, it would yield beneficial and potentially significant socio-economic impacts on aggregate income, employment, and population in Great Falls and Cascade County. ▪ HGS would also provide reliable electricity at reduced rates for SME's customer base.	▪ Construction of the Industrial Park facility would have a moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. ▪ During the long term operation of the facility at the Industrial Park site, it would yield beneficial and potentially significant socioeconomic impacts on aggregate income, employment, and population in Great Falls and Cascade County. ▪ The Industrial Park facility would also provide reliable electricity at reduced rates for SME's customer base.
Environmental Justice/Protection of Children	▪ No direct impact or effect from a power plant on persons living in poverty or children at either site.	▪ Would have a negligible effect on children or persons living in poverty, as these population groups	▪ Some potential of a slightly increased risk of impacting children and persons living in poverty from

Affected Resource or Issue	Alternative 1: No Action	Alternative 2: Highwood Generating Station – Salem Site (Proposed Action)	Alternative 3: Industrial Park Site (Generating Station at Alternate Site)
Environmental Justice/Protection of Children (continued)	▪ Higher electricity prices could disproportionately affect low-income residential consumers. ▪ Impacts would be moderate magnitude, intermittent-term duration, small extent, and possible likelihood.	are not generally present at or near the Salem Site.	this site, due to the fact that it is located in closer proximity to higher population areas and additional industrial sites. ▪ Impact of minor magnitude, long-term duration, medium extent, and improbable likelihood. ▪ Overall impacts would be adverse but non-significant.

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3.0 AFFECTED ENVIRONMENT

In response to public comments, RD and DEQ have made a number of edits to the text of Chapter 3. Other than updated maps to reflect the modified location of the HGS, there are no large changes. Any additions or changed text in the FEIS from the DEIS as a result of public comments are shown in double underlining. Deletions are not shown.

3.1 SOILS, TOPOGRAPHY, AND GEOLOGY

Great Falls and its surrounding areas lie within the western edge of the northern Great Plains physiographic area, which in its entirety reaches from Mexico far north into Canada and spreads out east of the Rocky Mountains. Specifically, Great Falls is located within the Missouri Plateau region of the Great Plains, which is characterized by several levels of rolling upland surmounted by small mountainous masses and flat-topped buttes and entrenched by streams. The area has been greatly dissected by the Missouri River and its tributaries (Figure 3-1).

Figure 3-1. Landscape of the Missouri River Canyon

The rather limited variety of landforms found on the Missouri Plateau is testimony to their glacial origin and to the great advances of the continental ice sheets. This is a stream-carved terrain that has been modified by continental glaciers and almost completely covered by a thick blanket of glacially transported and deposited till and rock debris, locally hundreds of feet thick but generally less than 50 feet (15 m) thick. Soils surrounding the area have developed from the gently rolling glacial drift and rock debris and are characterized by poorly developed drainage (Trimble, 1980).

The regional topography in the Great Falls vicinity primarily consists of gently rolling northern Great Plains and prairie at relatively high altitudes, with little change in relief. Average elevations in the area range from 3,300 to 3,600 feet (1,000-1,100 m) above mean sea level (MSL). Nearby mountain ranges partially encircle the Great Falls portion of the Missouri River valley. These include the Highwood and Little Belt Mountains, which are about 30 miles (50 km) away to the east and south, respectively. The Big Belt Mountains are 40 miles (65 km) distant to the southwest and the Front Range of the Rocky Mountains varies between 60 and 100 miles (100-160 km) distance to the west and northwest.

A hydrogeologic report was completed for area in September, 2005 (PBSJ, 2005). The deepest rock of consequence identified in this study is the Madison limestone, a thick sequence of dark

gray, hard limestone beds deposited during Mississippian Period or epoch, around 300 million years ago. The thickness of the Madison limestone is believed to be at least 1,000 feet (305 m) in this area.

Above the Madison limestone is the Morrison Formation of Jurassic age. Morrison sediments predominantly consist of intercalated sandstone and shale beds that are brown to dark gray, respectively. The Morrison Formation is about 100-200 feet (30-60 m) thick. Locally, below the Morrison Formation, is a separately recognized unit called the Swift Formation.

Overlying the Morrison Formation is the Cretaceous age Kootenai Formation. The upper portion of the Kootenai Formation consists dominantly of mudstone with some claystone and siltstone. This unit is chiefly grayish red to moderate red, with some greenish-gray and dark gray beds. The lower portion of the Kootenai is characterized by sandstone and siltstone. Sandstone color is light gray and weathers yellow-gray. The Kootenai Formation is roughly 200-250 feet (60-76 m) thick in this area (PBSJ, 2005).

3.1.1 SALEM SITE

The preferred location, the Salem Site, is located approximately 3,354 feet (1,022 m) above sea level. This site lies approximately eight miles (13 km) to the east of Great Falls, Montana, and site topography is gently sloping and undulating, sloping downward to the west and north toward the Missouri River.

The geology of the area to the east of Great Falls is characterized by a thick sequence of sedimentary rocks overlain by a mantle of glacial and alluvial deposits. Glacial deposits beneath the Salem Site were identified during a geotechnical investigation that consisted of drilling 67 borings to depths ranging from 11.5 to 60 feet (3.5-18 m) (PBSJ, 2005). Site geology consists of eolian (wind-blown) deposits of Holocene age composed of silty sand, underlain by Pleistocene-age glacial lake bed deposits and glacial till layers. The glacial lake deposits are the end result of Glacial Lake Great Falls, a large lake that formed at the southern margin of the great ice sheets. Beneath the upper fine-grain layers, alluvial silt and sand and gravel deposits of the ancestral Missouri River were observed. The unconsolidated sediments extend 125 to 150 feet (38-46 m) below ground where the Kootenai Formation is found.

At the ground level, the Salem site is located entirely on Pendroy Clay soils, with 2-8 percent slopes. The Pendroy series consists of very deep, well-drained soils formed from clayey parent materials on alluvial fans, floodplains, stream terraces, and lake plains. These soils have a clay content of 60-75 percent through the surface and subsurface horizons

Soils Terminology

Parent Material: The unconsolidated mass from which soil forms. The characteristics of the parent material determine soil characteristics such as thickness and texture of the horizons, mineralogy, color, and reaction.

Soil Series: A group of soils formed from the same parent material under similar conditions and having the same kind and sequence of all major horizons and the same land use properties.

Soil Association: A landscape, named for its major soil series, which has a distinctive proportional pattern of soils, generally consisting of one or more major soils and at least one minor soil series.

(0-40” deep), below which the clay content decreases slightly to 50-65 percent (at 40-70” or 1.0-1.8 m of depth). As a result of these contents, Pendroy soils exhibit very slow permeability (NRCS, no date). Figure 3-2 is a soils map of the Salem site.

Pendroy Clay soils are in hydrologic group D, which consists of soils with high runoff potential. Hydrologic group D soils have very slow rates of water transmission and infiltration. Additionally, Pendroy soils are classified as CH soils according to the Unified system and A-7 soils according to the American Association of State Highway and Transportation Officials (AASHTO) system. The Unified system classifies soils according to properties that affect their use for engineering and construction purposes. The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance, including the particle-size distribution and Atterberg limits (the liquid limit and plasticity-index of the soil). CH soils are at the extreme end of the Unified classification system for fine-grained high content inorganic clay soils which exhibit high plasticity. Similarly, A-7 soils are at the extreme fine-grained particle end of the AASHTO measurement spectrum, and contain minimal to no coarse-grained particles.

3.1.2 INDUSTRIAL PARK SITE

The alternate site location, the Industrial Park Site, is located approximately 3,530 feet (1,076 m) above sea level. Figure 3-3 is a soils map of the site.

The great majority of the facilities at the Industrial Park site (96.2 acres or 39 ha) would be located on Ethridge-Kobase (formerly known as Kobar) silty clay loams, with 0-2 percent slopes, and a smaller amount of facilities, including railbed and access roads, (8.1 acres or 3.3 ha) would be located on Linnet-Acel silty clay loams, also with 0-2 percent slopes. Additionally, some short sections of the transmission lines and railroad bed would be located on Kobase (Kobar) silty clay loam and Lothair silty clay loam.

Ethridge-Kobase (Kobar) silty clay loams are very deep, well-drained soils formed in alluvium and glaciofluvial deposits from mixed rock sources, or glaciofluvial or glaciolacustrine deposits. They are found on till and lake plains, stream terraces, alluvial fans, drainage ways, sedimentary plains, and hills. Slopes are 0 to 40 percent. These soils have a clay content of 27-35 percent in the surface horizons (0-20” deep), after which the clay content increases slightly to 35-45 percent (at 10-60” of depth). Ethridge-Kobase soils exhibit slow permeability (NRCS, no date).

Linnet-Acel silty clay loams are also very deep, well-drained soils formed in clayey alluvium, glaciolacustrine, or glaciofluvial deposits. They are located on lake plains, stream terraces, alluvial fans, drainage ways, and till plains. Slopes are 0 to 10 percent. These soils have a clay content of 30 to 40 percent in the surface horizons (0-6” deep), after which the clay content increases to 40-55 percent (at 6-60” of depth). The Linnet-Acel soils exhibit slow permeability (NRCS, unknown date).

Ethridge-Kobase (Kobar) and Linnet-Acel soils are all in hydrologic group C, which consists of soils that have a slow infiltration rate when thoroughly wetted. Hydrologic group C soils have moderately fine to fine texture and exhibit slow rates of water transmission. Additionally,

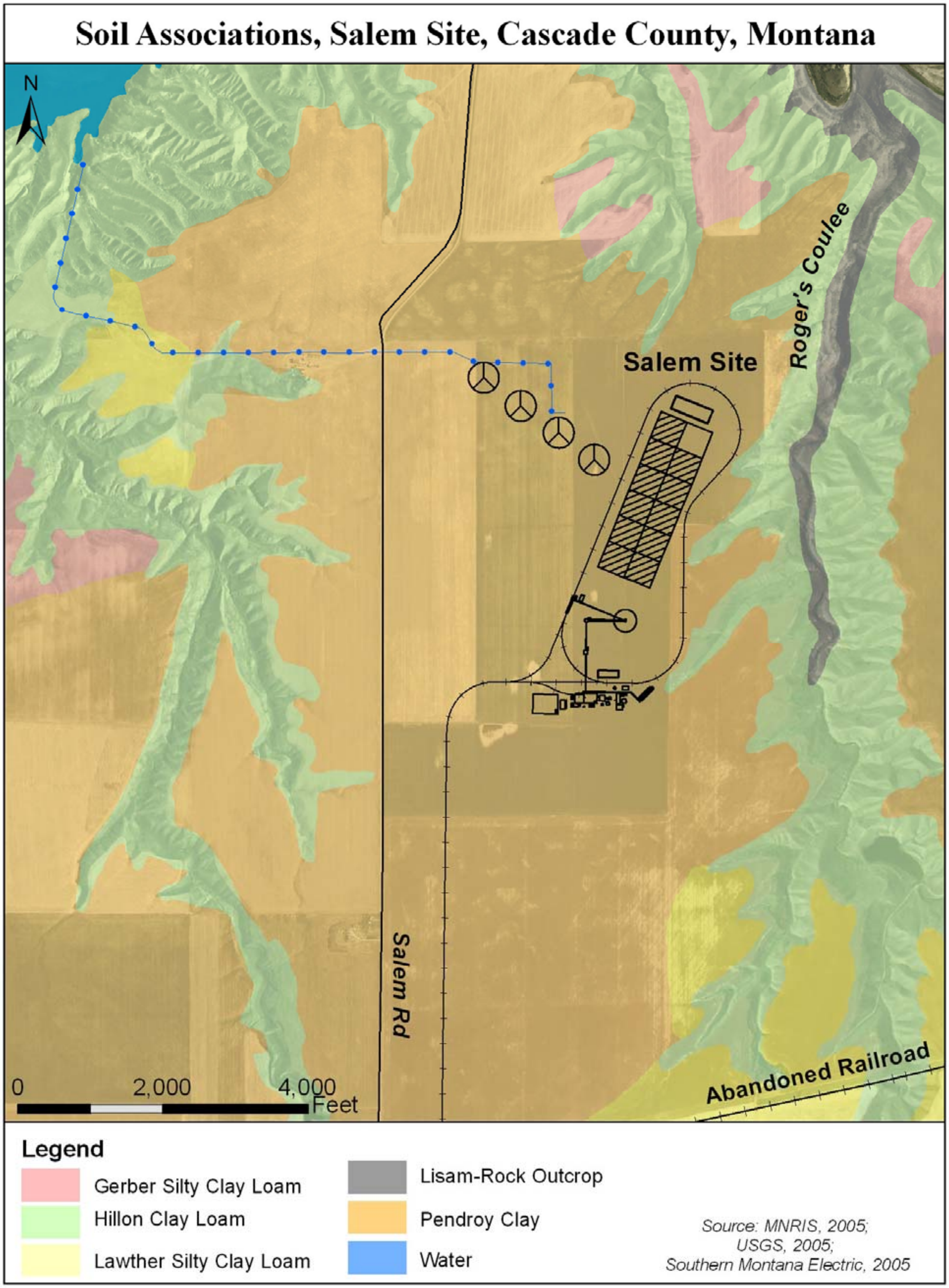


Figure 3-2. Soils Map of the Salem Site

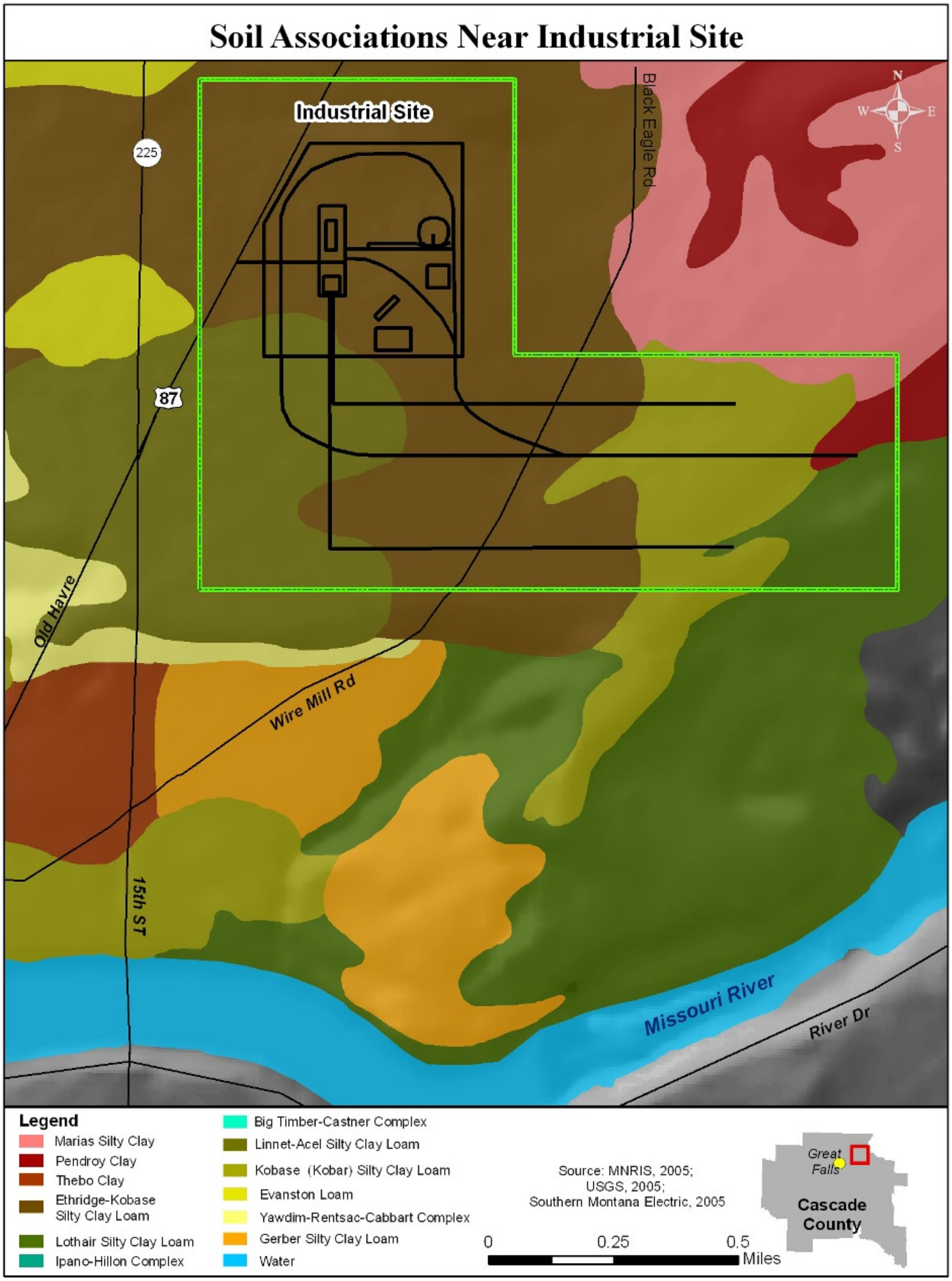


Figure 3-3. Soils Map of the Industrial Park Site

Ethridge-Kobase and Linnet-Acel soils are classified as CL soils according to the Unified system and A-6/A-7 soils according to the AASHTO system. Soils classified as CL by the Unified system are fine grained soils. Specifically, these soils are inorganic clay soils of low to medium plasticity. Similarly, soils classified as AAHSTO A-6/A-7 soils include plastic clay soils which usually have high volume changes between the wet and dry states, meaning that they will compress when wet and shrink and swell with changes in moisture content.

Lothair silty clay loams are located on the southeast edge of the proposed property, where some amount of transmission lines and railroad would potentially be located. Lothair soils consist of very deep, well-drained soils that formed in alluvium and lacustrine deposits. The soils are found on alluvial fans and stream terraces. The clay content throughout the Lothair soil horizons is between 35-45 percent.

3.2 WATER RESOURCES

3.2.1 MISSOURI RIVER

From the junction of the Jefferson, Madison and Gallatin Rivers near Three Forks, Montana, the Missouri River extends approximately 2,384 miles (3,837 km) in a northeasterly then southeasterly direction to its mouth just upstream of St. Louis, Missouri, where it joins the Mississippi River. The Missouri River is the longest river in the U.S., and the river basin has a total drainage area of 529,350 sq. miles (1,371,010 sq. km) (USACE, 2004). The river is considered a navigable U.S. water by both the Army Corps of Engineers and the State of Montana from Three Forks down to the Montana-North Dakota border. The City of Great Falls is located at river mile 2093, just under 300 miles (485 km) north of the river's beginning near Three Forks.

The Missouri River receives additional federal protection 50 miles (80 km) downstream from Great Falls near Fort Benton, where it is designated a Wild and Scenic River. Much further downstream, the river is nicknamed "Big Muddy" for its heavy load of silt and sediment. The Missouri River's brown waters do not readily mix with the gray waters of the Mississippi River until approximately 100 miles (160 km) downstream of their confluence (MRA, no date).

Figure 3-4. Missouri River Downstream of Great Falls

The Missouri's fluctuating flow is now regulated by seven large dams (Fort Peck, Garrison, Oahe, Big Bend, Fort Randall, Gavins Point, and Canyon Ferry) and more than 80 smaller dams on the river and tributary streams. Since the dams have no locks, Sioux City, Iowa, is the head of navigation for the river over the 760-mile (1,220-km) stretch downstream to the confluence with the Mississippi. Tugboats pushing strings of barges move freight along this route.

The major dams on the Missouri, along with their reservoirs, are part of the coordinated, basin-wide Missouri River basin project, authorized by the U.S. Congress in 1944, which envisioned a comprehensive system of flood control, navigation improvement, irrigation, municipal and industrial water supply, and hydroelectric generation facilities for the 10 states in the Missouri River basin. Though the project was only partially completed, it completely changed water resource development in the basin (USACE, 2004).

Figure 3-5. Black Eagle Falls Dam on the Missouri River in Great Falls
Source: bigskyfishing.com

In the Great Falls area, there are five major sets of waterfalls on the Missouri River. The falls are known as: the Great Falls of the Missouri, Crooked Falls, Rainbow Falls, Colter Falls, and Black Eagle Falls. Black Eagle Falls is the only set that is actually within the city limits of Great Falls. Rainbow Falls is on the eastern edge of town near Malmstrom Air Force Base. The Great Falls of the Missouri is several miles east of town.

There are five hydroelectric dams on the Missouri River in Cascade County: Black Eagle Dam, Cochran Dam, Morony Dam, Rainbow Dam, and Ryan Dam. None of these dams are considered major dams by the U.S. Army Corps of Engineers (USACE, 2004). The first dam was Black Eagle Dam, built at the top of Black Eagle Falls in 1891. The second dam built was Rainbow Dam in 1910. Rainbow Dam sits on top of Rainbow Falls, just up river from Crooked Falls. The next dam to be built was Volta Dam in 1915. The Volta Dam was renamed Ryan Dam in 1940. Ryan Dam sits on top of the actual Great Falls of the Missouri. Morony Dam was constructed in 1930, and the last dam, Cochran, was built in 1958.

Crooked Falls is the only visible falls in the Missouri/Mississippi River system that has not had a dam constructed on it.

The USGS maintains a gauging station on the Missouri River near Great Falls (gauging station 06090300). The station is located on the left bank of the River, 700 feet (210 m) downstream from Morony Dam, and 12.6 miles (20.3 km) northeast of Great Falls at river mile 2,105.4. The drainage area into the River at this station is 23,292 sq. miles (60,326 sq. km) of land. Measurements for Missouri River flows at this gauging station have been recorded consistently since 1957. As increased quantities of water have steadily been diverted from the river for agricultural, residential, and industrial uses since 1957, surface flows in the Missouri have accordingly decreased. Between 1957 and 2004, the annual mean river flow at the Great Falls gauging station was 7,435 cubic feet per second (cfs). In 2003, the annual mean river flow at the station was 5,376 cfs, and in 2004, the annual mean river flow was 4,601 cfs (USGS, 2005).

Overall, Missouri River Basin water projects and withdrawals have significantly reduced the annual flow and magnitude of peak flows of the Missouri at Great Falls, and areas downstream, from that of the predevelopment era. However, the seasonal timing of peak flows in Great Falls remains fairly consistent with the predevelopment era, as the area continues to experience annual peaks in river flow in late spring and early summer. Specifically, the spring rains and snowmelt that occur in the river basin which drains into the river near Great Falls swell the volume of the river in April, June, and early July, as seen below in the USGS average daily streamflow for 2002 and 2003.

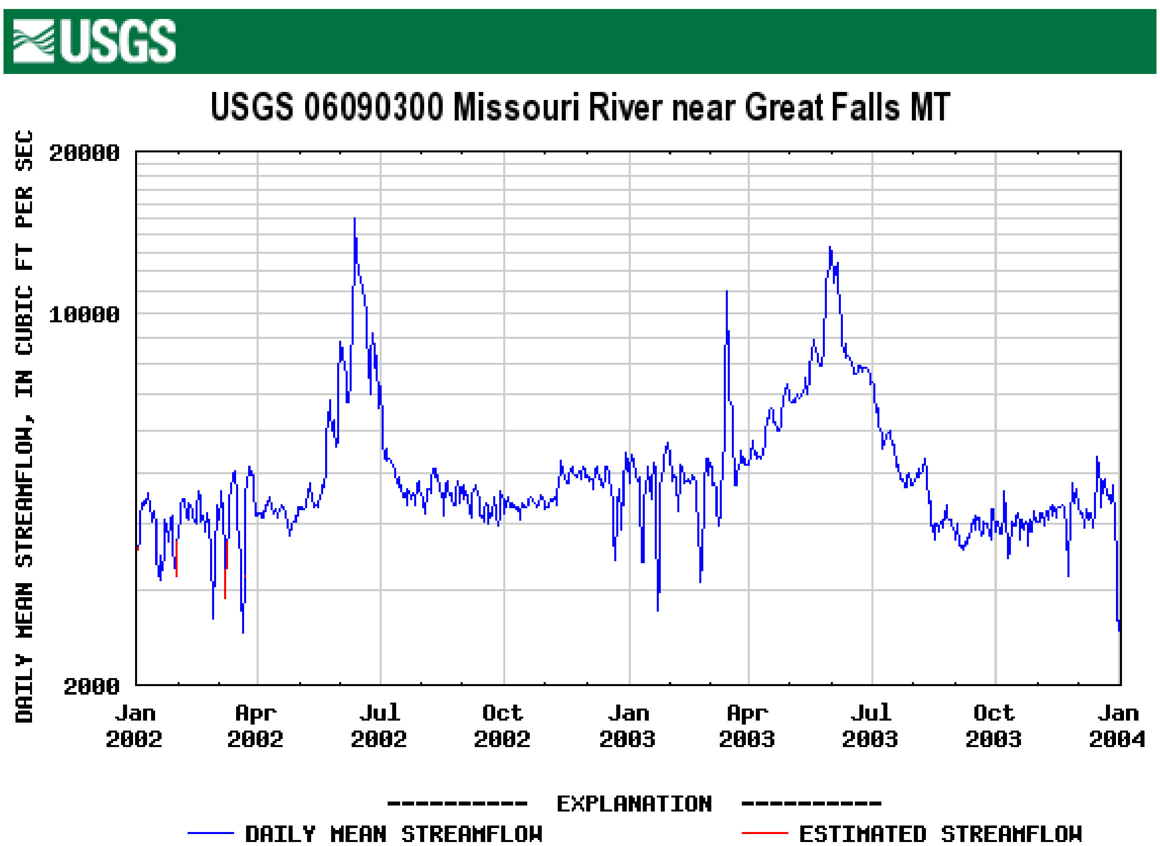


Figure 3-6. Missouri River Flow near Great Falls

3.2.2 WETLANDS AND FLOODPLAINS

The extensive use of dams along the Missouri River has provided substantial flood control for the river banks and farmlands along the Plains in Montana. However, as flood control has improved, floodplains and wetlands have been increasingly drained and developed. Both wetlands and floodplains have steadily declined with increased development in the Missouri River basin. In the last century, hundreds of thousands of acres of wetlands and nearly three million acres (1.2 million hectares) of riverine floodplain have been lost or substantially altered in the Upper Missouri River basin (USGS, 2004).

Wetlands within the project vicinity generally are limited to the incised drainage habitat and narrow fringes of the Missouri River and its tributaries (Westech, 2005). Though limited, these wetlands provide an invaluable resource for the filtration and adsorption of stream nutrients and contaminants, and for waterfowl and wildlife habitat. Five bird species on the State species of concern list have been documented in wetlands within ten miles (16 km) of Great Falls: white-faced ibis, black-crowned night heron, Franklin's gull, common tern, and black tern (Westech, 2005).

Wetlands

The regulatory definition of a Section 404 jurisdictional wetland, according to the Army Corps of Engineers, is "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (USACE, 1987).

Floodplains similarly follow the fringes of the perennial streams in the area. Along the Missouri River in the vicinity of the project areas, the floodplains do not extend over the river banks due to the fact that the river runs through a deeply incised channel with sides from sixty to over several hundred feet high (Nerud, 2006). The configuration and size of the channel, along with the area dams, prevent the project sites from receiving most flood waters.

Additional site specific information for the two sites under consideration is provided below, in their respective subsections.

Development in, and encroachment upon, floodplains and wetlands is regulated at the local, state, and federal level. Table 3-1 summarizes some of the key regulations governing the floodplains, wetlands, and waters within the project vicinity.

3.2.3 LISTED SPECIES ASSOCIATED WITH MISSOURI RIVER

Generally, reduced average and peak flows and altered sediment transport associated with river development have deepened and narrowed the Missouri River channel, with consequences for sensitive wildlife and fish populations described in Section 3.4.4.

Three federally threatened or endangered aquatic species, listed under the Endangered Species Act (ESA), are found within the Missouri River drainage in Montana: the pallid sturgeon, least tern, and piping plover.

Table 3-1. Water-Related Regulations

Regulation/Permit	Nature of Permit	Agency/Authority
Clean Water Act (404 Permit)	Controls discharge of dredged or fill materials in wetlands and other water of the U.S.	U.S. Army Corps of Engineers, Omaha District
Federal Rivers and Harbors Act (Section 10 Permit)	Regulates construction of any structure in or over any federally listed navigable waters of the United States, the excavation from or depositing of material in such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters.	U.S. Army Corps of Engineers, Omaha District
Montana Land-Use License or Easement on Navigable Waters	Protects riparian areas and the navigable status of water bodies.	MT Dept. of Natural Resources and Conservation, Trust Land Division
Short-Term Water Quality Standard For Turbidity (318 Authorization)	Requires a permit for any activity in any state water that will cause unavoidable short-term violations of water quality standards	MT Dept. of Environmental Quality
Public Water Supply Watersheds	Requires the approval of detailed plans prior to the beginning of new electric plant construction in a public supply watershed.	MT Dept. of Environmental Quality
Clean Water Act (401 Certification)	Requires applicant for a federal permit or license that may result in a discharge to waters of the United States to first obtain certification from the state.	MT Dept. of Environmental Quality
Stormwater Discharge General Permits (MPDES permit)	Regulates stormwater discharges to surface water or groundwater during and following construction activities.	MT Dept. of Environmental Quality
Montana Stream Protection Act (SPA 124 Permit)	Regulates the construction of new facilities or the modification, operation, and maintenance of an existing facility that may affect the natural existing shape and form of any stream or its banks or tributaries.	MT Fish, Wildlife and Parks
Cascade County Floodplain Permit	Requires a permit to build permanent structures or to place fill in a designated flood plain.	Cascade County Planning Department
Montana Natural Streambed and Land Preservation Act (310 Permit)	Requires a permit to perform work in or near a stream and ensures that projects are not damaging to the stream or to adjoining landowners.	Cascade County Conservation District
Montana Water Quality Act (MPDES Permit)	Regulates the pollution of state waters and the placement of wastes in a location where they are likely to cause pollution of any state water.	MT Dept. of Environmental Quality

Each of these species is found in the river waters below Fort Peck Dam. Fort Peck Dam is the closest major dam to the river's headwaters and the closest major dam to Great Falls. It is located over 250 miles (400 km) downstream of Great Falls, and was built during the dust-bowl depression of the 1930s for flood control, irrigation and barge traffic. Below the dam, the flows of the Missouri go down abnormally in the spring and back up in the summer. The river that once occupied its floodplain, wide and slow with braided channels, is now narrow and fast. River biota has dwindled as it lost its natural connections to the floodplain. High summer flows wash away the nests of the least tern and cause the absence of plant-studded sandbars needed for breeding and raising young (MRA, no date).

Studies by the U.S. Fish and Wildlife Service and the National Academy of Sciences indicate that lower reaches of the Missouri River are in serious decline and that action must be taken to reverse the damage and restore some semblance of the river's natural flow out of Fort Peck Dam if the pallid sturgeon, least tern and piping plover are to be saved from extinction (MRA, no date).

3.2.4 SURFACE WATER QUALITY

Both the federal Clean Water Act (CWA) and the Montana Water Quality Act require an ongoing program of water quality assessments and reporting as part of the process intended to protect and improve the quality of rivers, streams, and lakes in the state. The EPA administers the provisions of the CWA while the Water Quality Planning Bureau of DEQ provides water quality assessment of waters within the state. The state 303(d) list contains specific information relating to waters assessed as having one or more of their beneficial uses impaired or threatened by human activities. A water quality management plan must be developed for any water found to have beneficial uses impaired or threatened, to correct the causes of the identified impairments. In those cases where the impairment involves the need to reduce the load of specific concentrations in the water, the water quality management planning process must include the identification of a total maximum daily load (TMDL) for each pollutant causing any standards exceedances.

Water bodies listed as impaired or threatened in Montana include all of the major drainages downstream of the proposed project sites, including each of the reaches of the Missouri River in the Upper Missouri-Dearborn watershed, and Belt Creek in the Belt watershed (DEQ, 2004c) (Figure 3-7).

The Missouri River is listed as not supporting the beneficial uses of aquatic life, coldwater fishery, warm water fishery, and drinking water. Probable causes of the river impairment include PCBs, metals, siltation, turbidity, and thermal modifications. Probable sources of the impairment are listed as being industrial point sources, dam construction, hydromodification, and agriculture.

Belt Creek is listed as not supporting the beneficial uses of aquatic life, coldwater fishery, and drinking water. Probable causes of the stream impairment include metals, siltation, bank erosion, fish habitat degradation, and other habitat alterations. Probable sources of the impairment are listed as being highway/road/bridge construction, resource extraction, acid mine drainage, channelization, construction, hydromodification, agriculture, and grazing-related sources.

TMDL development has not yet begun for the impaired stream segments within the project area.

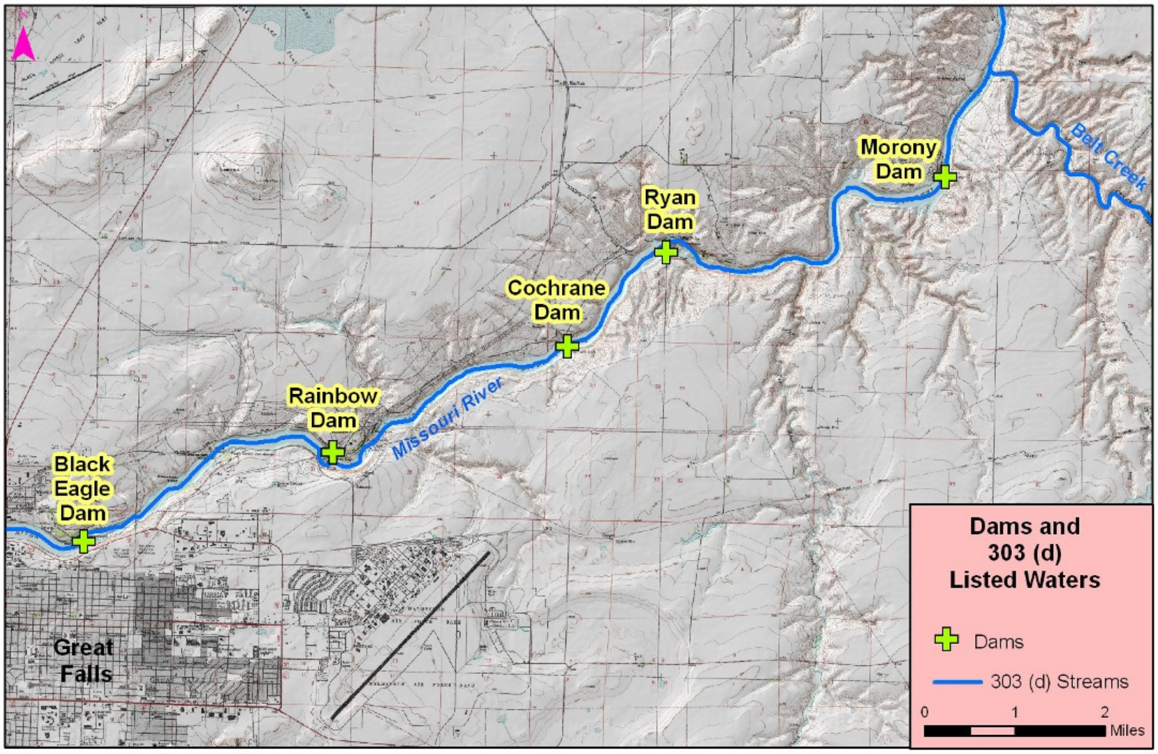


Figure 3-7. DEQ-Designated Impaired and Threatened Waters near Great Falls

3.2.5 WATER RIGHTS

Like most of the Western states, Montana is a Prior Appropriation state. Under the Prior Appropriation Doctrine, a party must have a water right to appropriate water from a river, stream, or other source. Users of municipal water supplies and other water users who buy their water from a water supply system do not need to have a water right. However, the municipality or water supply system owner must have a water right in order to divert water.

Water rights in Montana are regulated by the Montana Water Use Act of 1973 (Mont. Code Ann. §85-2-101 et seq.). A party may appropriate water by applying for a "Permit to Appropriate Water" from the Department of Natural Resources and Conservation (DNRC). In order to appropriate water, the party must prove by a preponderance of evidence that: 1) there is water physically available at the proposed point of diversion; 2) water is legally available during the period of appropriation, in the amount requested; 3) the water rights and/or water quality of a prior appropriator will not be adversely affected; 4) the water will be put to beneficial use on property in which the party has a possessory interest; and 5) the proposed means of diversion, construction, and operation of the diversion works is adequate. For appropriations meeting or exceeding 5.5 cubic feet per second or 3000 acre-feet per year, a higher evidentiary standard of "clear and convincing" applies, as well as additional information showing that the proposed use is reasonable (Mont. Code Ann. §85-2-311).

The priority of a water right in a Prior Appropriation state is probably the most important part of the right. Water rights are exercised in accordance with their order of priority, starting with the

earliest (senior) rights and progressing to the later (junior) rights, until the water is all appropriated.

Generally, water rights automatically transfer with the land when the land is conveyed to someone else, unless specifically withheld through the appropriate legal documentation. However, in order to use these water rights at another location, DNRC approval is required. Changes in a water right subject to DNRC jurisdiction include a change in the point of diversion, the place of use, the purpose of use, or the place of storage. A change in a water right can be made so long as there is no "adverse effect" to other appropriators, both junior and senior. Before any change can be initiated, approval from the DNRC must be obtained.

Water rights in Montana can be divided into two categories: those that pre-date the 1973 Water Use Act, and Post-1973 developments. Water rights acquired prior to July 1, 1973, with the exception of exempt rights, are Statements of Claim, and subject to adjudication by the Water Court. Statements of Claim include many types of water rights in Montana, acquired in accordance with the particular rules that applied at that time. Specific types of Statements of Claim include:

Use water rights: water rights that were acquired by merely appropriating and beneficially using the water. No recording, approval from a government agency, or other written record of the right was required. Approximately 67 percent of the water rights filed in Montana's statewide adjudication are use rights. The priority date of use rights is generally the date the water was first put to beneficial use.

Filed rights: water rights that were filed with the local county Clerk and Recorder's Office under a system that was first statutorily recognized in 1885 and which continued until the July 1, 1973, effective date of the Water Use Act of 1973.

Decreed rights: water rights that were initially use or filed rights that have been adjudicated (decreed) by a district court. These rights are more certain in their existence, because a district court previously reviewed the evidence and decided, at least at the time of the decree that a water right existed.

Court Approved Rights on Adjudicated Streams: water rights that have been approved by a district court after 1921 on an adjudicated stream. The 1921 legislature required water users on adjudicated streams to petition the district court for new appropriations.

Murphy Rights: In 1969, the Montana Legislature enacted legislation granting the Montana Fish and Game Commission authority to appropriate waters on twelve streams to maintain instream flows for the preservation of fish and wildlife habitat. The Legislature established specific reaches to appropriate on these streams, including the Missouri River in Broadwater, Lewis and Clark and Cascade counties, and the Smith River in Cascade and Meagher counties (Doney, 1990).

As mentioned previously, certain water rights were exempted from the adjudication filing statutes. These included groundwater developments used for stock or domestic (one household)

put to use prior to 1962, or put to use prior to July 1, 1973 and filed with the county under the groundwater codes. Stock drinking directly from surface water streams prior to July 1, 1973 was also exempted from the filing requirements.

Appropriations occurring after the passage of the Water Use Act are under the jurisdiction of the DNRC:

Provisional Permits: All appropriations of surface water and groundwater diversions exceeding 35 gallons per minute or 10 acre-feet require permits from the DNRC before water can be put to beneficial use. The application process and criteria are as previously discussed.

Groundwater Certificates: Except in controlled groundwater areas, a party does not need to apply for a permit to develop a well with an anticipated use of the 35 gallons per minute or less (not to exceed 10 acre-feet per year). The party must only file a Notice of Completion for well drilling with the DNRC. For groundwater appropriations over 35 gallons per minute, or exceeding 10 acre-feet per year, a party must submit an application to DNRC for a "Permit to Appropriate Water" before developing the well. There are no controlled groundwater areas within Cascade County (MDNRC, 2004).

State Water Reservations: The Water Use Act of 1973 authorized state and federal agencies to apply to the DNRC to acquire a state water reservation for existing or future beneficial uses. With regard to the study area, water reservations were granted on the Missouri River above Fort Peck Dam on July 1, 1992, and have a priority date of July 1, 1985.

Water Leases: The Department of Fish, Wildlife & Parks is authorized to lease water on a temporary basis for the purpose of maintaining or enhancing streamflows.

Montana has closed some of its river basins to certain types of new water appropriations because of water availability problems, water quality issues, and a concern for protecting existing water rights. There are several types of basin closures, including: controlled groundwater areas, petitioned surface water basins closed by administrative rule, DNRC ordered closures (Milk River), Compact closures, and Legislative closures. Included in the legislative closures is the drainage area of the Missouri River and its tributaries above Morony Dam in the Upper Missouri River Basin, which the Great Falls area is located within. Since April 16, 1993, this basin is closed to certain new appropriations of water until final decrees have been issued for all of the sub-basins of the Upper Missouri River basin (MDNRC, 2004).

3.2.6 GROUNDWATER

The Great Falls area has ample groundwater resources, and the depth to water varies depending on the aquifer used as a source of water (Figure 3-8). The shallow alluvial aquifer contains water that is generally is less than 100 feet (30 m). This aquifer does not appear to be present beneath the Salem site based on geotechnical soil borings and local well logs.

The Kootenai Formation is the most commonly used aquifer in the area. The aquifer is used mostly for domestic purposes and public water supply, and is recharged by snow pack and runoff

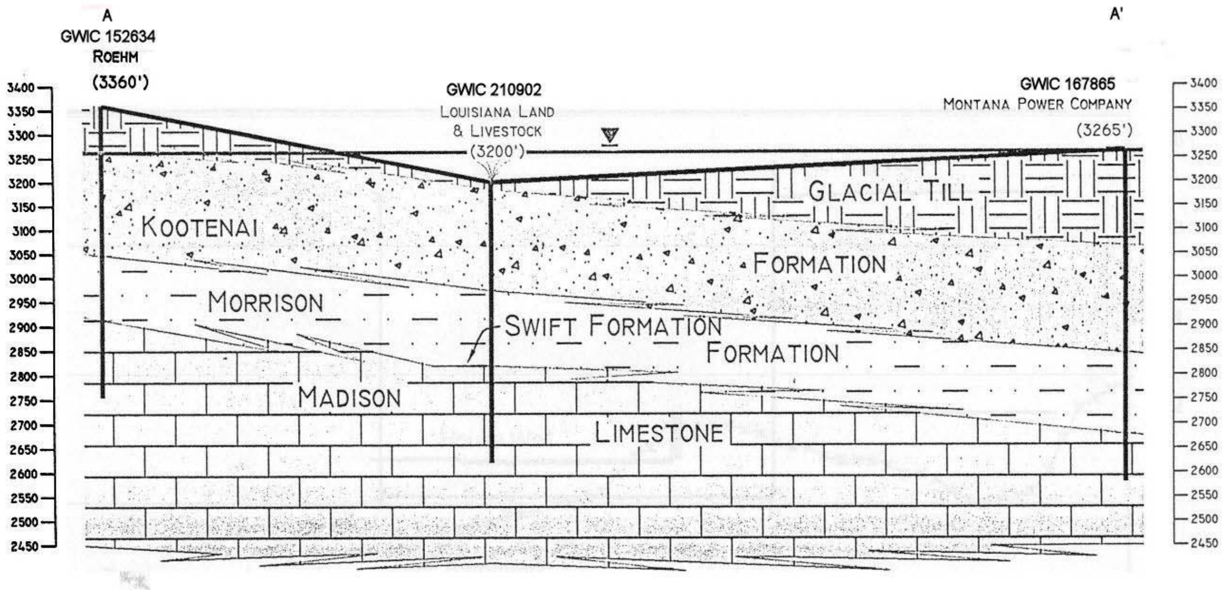


Figure 3-8. Geologic Cross-Section in Vicinity of the Salem Site
Source: PSBJ, 2006a

in streams. The thickness of the Kootenai Formation averages 200-250 feet (60-76 m). The upper portion of the Kootenai Formation consists primarily of mudstone with some claystone and siltstone. The lower portion of the Kootenai is characterized by sandstone and siltstone. The productive portion of the formation is normally found in these rocks. Estimated average hydraulic conductivity of this aquifer is 182 ft/day. The predominant groundwater flow within the aquifer is towards the Missouri River (Figure 3-9) (PBSJ, 2006a).

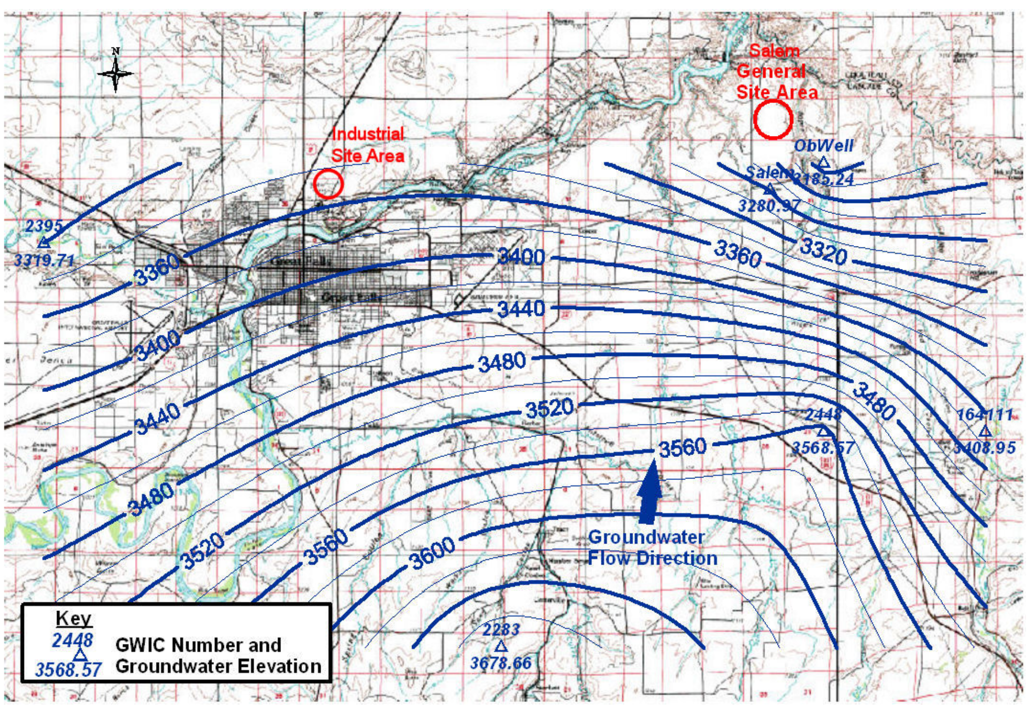


Figure 3-9. Kootenai Formation Groundwater Elevation Contours

Below the Kootenai Formation is the Morrison Formation of Jurassic Age. It is about 100-200 feet thick (30-60 m). The Morrison sediments consist of intercalated sandstone and shale beds. It is the confining unit for the underlying Madison Formation. The Morrison is not a water producing formation in the Great Falls area (PBSJ, 2006a).

The second most commonly used aquifer in the area is the Madison limestone aquifer. This aquifer is used mostly for domestic purposes and public water supply, and, like the Kootenai Formation aquifer, is recharged by snow pack and runoff in streams. The Little Belt Mountains are the recharge area for the Madison limestone aquifer. The thickness of the Madison aquifer averages 500 feet (150 m). The Madison aquifer is a confined aquifer in the vicinity of Great Falls. Estimated average hydraulic conductivity of this aquifer is 321 ft/day. The predominant groundwater flow direction within the water table aquifer is towards the Missouri River; specifically, in the areas south of the river the direction of groundwater flow is to the north-northeast (Figure 3-10) (PBSJ, 2006a).

The quality of the groundwater is generally good in the Great Falls vicinity, with the exception of a few water quality parameters. Elevated concentrations of sulfate, manganese, and cadmium, were measured in the alluvium, Kootenai, and Morrison formations. If the alluvial samples are ignored, then the data seem to indicate a logical progression and evolution of water quality with residence time and with depth/source rock type. Total dissolved solids (TDS), sulfate, hardness and bicarbonate/alkalinity increase from the shallow noncarbonate rocks (Kootenai) to the Morrison and then to the deeper carbonate rocks in the Madison. All of these waters are moderately to extremely hard (PBSJ, 2006a).

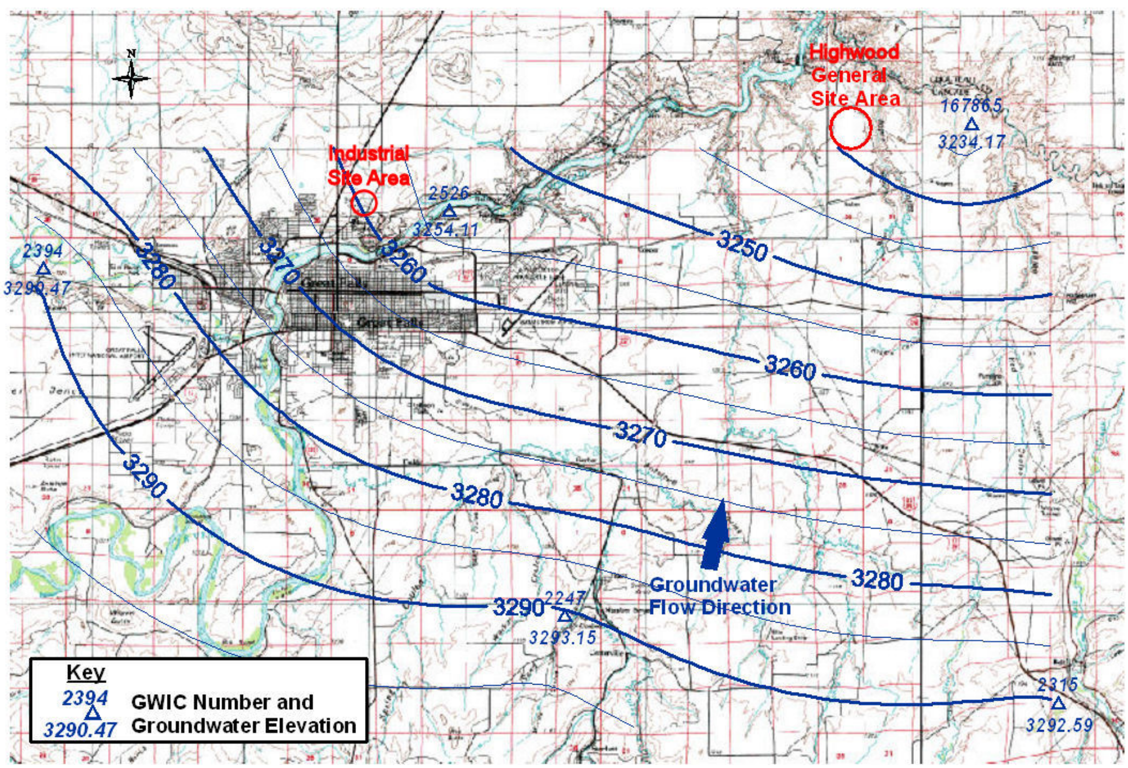


Figure 3-10. Madison Limestone Groundwater Elevation Contours

3.2.7 WATER UTILITIES

Incorporated areas of the City of Great Falls, including residents of Great Falls, Malmstrom Air Force Base and Black Eagle, are serviced by the City's Public Works Utility Branch, which operates water and wastewater treatment plants. Great Falls is classified as a medium (between 50,000 and 100,000 people served) surface water community public supply. Public drinking (potable) water is treated surface water from the Missouri River. The water treatment facility providing potable water to the city is located on the east bank of the Missouri just upstream from its confluence with the Sun River in Great Falls (GFWU, 2005). The public drinking water supply treated at the Great Falls plant meets all federal and state requirements and reported no violations, exemptions, or variations in water quality in 2004 (GFWU, 2005).

Wastewater generated within Great Falls is treated at the city's wastewater treatment facility, located on the north, or west, bank of the Missouri River. Powerful pump stations are located on the south side of the river and pump sewage from the city and other areas across the river to the facility. Veolia Water of North America is contracted by the city to manage and operate the treatment facility. The facility has a capacity to treat up to 21 million gallons per day (mgd) of wastewater, though it currently receives approximately 9 mgd (Jacobson, 2006a).

It is the traditional policy of the City of Great Falls that city services, including water and sewer, are not available to non-annexed/non-incorporated land. However, the City has indicated a willingness to consider allowing connection to water and wastewater utilities prior to annexation in exchange for the provision by SME of a waiver of right to protest annexation in the future.

3.2.8 SALEM SITE – SURFACE WATERSHEDS/AQUATIC FEATURES

The Salem site is located within the Upper Missouri River Basin and the Missouri-Sun-Smith River Sub-Basin. The Missouri-Sun-Smith River Sub-Basin consists of five watersheds that all drain into the Missouri River. The Salem site is located in two of these watersheds. The western majority of the site is located within the Upper Missouri-Dearborn watershed while the eastern portion of the site is located within the northwestern most tip of the Belt watershed (Figure 3-11).

Belt Creek is the primary drainage stream located within the Belt watershed, and it is a direct tributary to the Missouri. It joins the Missouri just downstream of the Salem site, approximately 15 river miles (24 km) northeast of Great Falls.

There are several intermittent streams in the vicinity of the Salem site. To the east, drainage from the site would flow into Rogers Coulee, a drainage channel which connects with Belt Creek just northeast of the site. To the west of the site, and located immediately west of Salem Road, there are several unnamed drainage channels with intermittent flows to the Missouri River. Both Rogers Coulee and the drainages discussed above are dry the majority of the year and contain flowing water only during major overland runoff events. Box Elder Creek is the first named tributary of the river located on the west side of the site. Surface water flows in a north to northeast direction throughout this area, into the Missouri River.

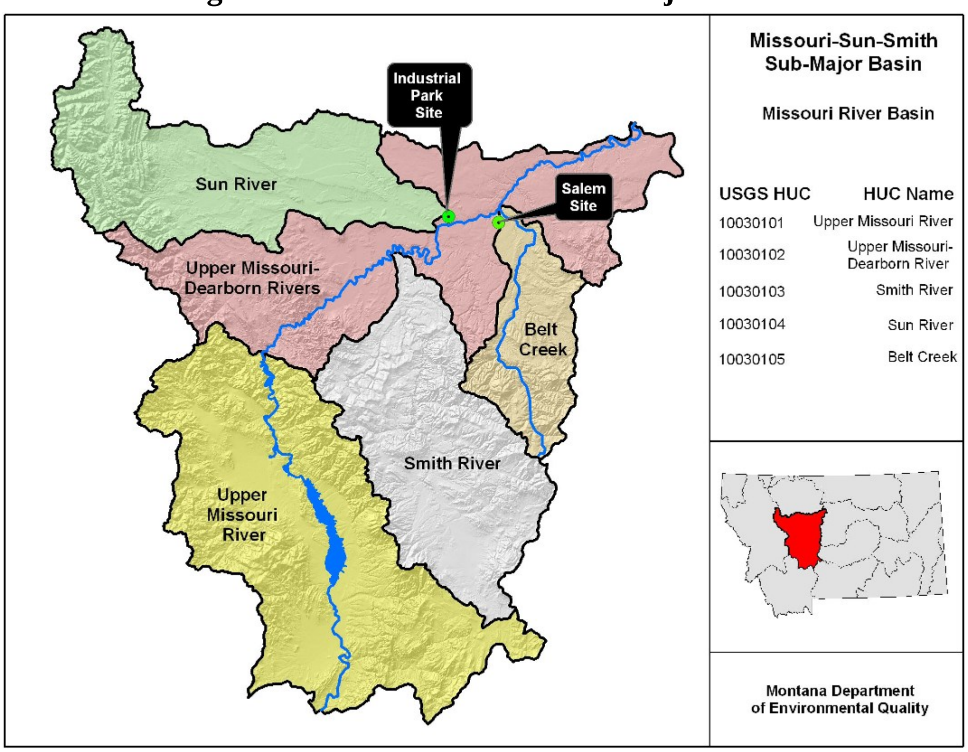
Lacustrine limnetic wetlands are associated with the unnamed tributaries and the Missouri River northwest of the site, where the raw water intake corridor would be located in the Morony pool, immediately upstream from the Morony dam.

Lacustrine limnetic wetlands have the following characteristics: they are (1) situated in a topographic depression or a dammed river channel; (2) lacking trees, shrubs, persistent emergents, emergent mosses or lichens with greater than 30 percent areal coverage; and (3) total area exceeds 20 acres (8 ha). Similar wetland and deepwater habitats totaling less than 8 ha are also included in the lacustrine system if an active wave-formed or bedrock shoreline feature makes up all or part of the boundary, or if the water depth in the deepest part of the basin exceeds 6.6 feet (2 m) at low water.

Lacustrine system wetlands are bounded by upland or by wetland dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Lacustrine systems formed by damming a river channel are bounded by a contour approximating the normal spillway elevation or normal pool elevation. Where a river enters a lake, the extension of the lacustrine shoreline forms the riverine-lacustrine boundary (USGS, 1998).

Figure 3-12, on the page following Figure 3-11, depicts the principal aquatic and hydrologic features in the vicinity of the proposed Salem site. As discussed above, the only flowing streams in the vicinity of the site are Belt and Box Elder Creeks. The remaining drainages are intermittent, that is, dry during most of the year and containing flowing water only during overland runoff events. According to the reconnaissance-level USFWS National Wetlands Inventory, five small, isolated palustrine emergent wetlands occur on the site. These are not "jurisdictional wetlands" under current interpretation of Section 404 of the Clean Water Act.

Figure 3-11. Watersheds in the Project Area



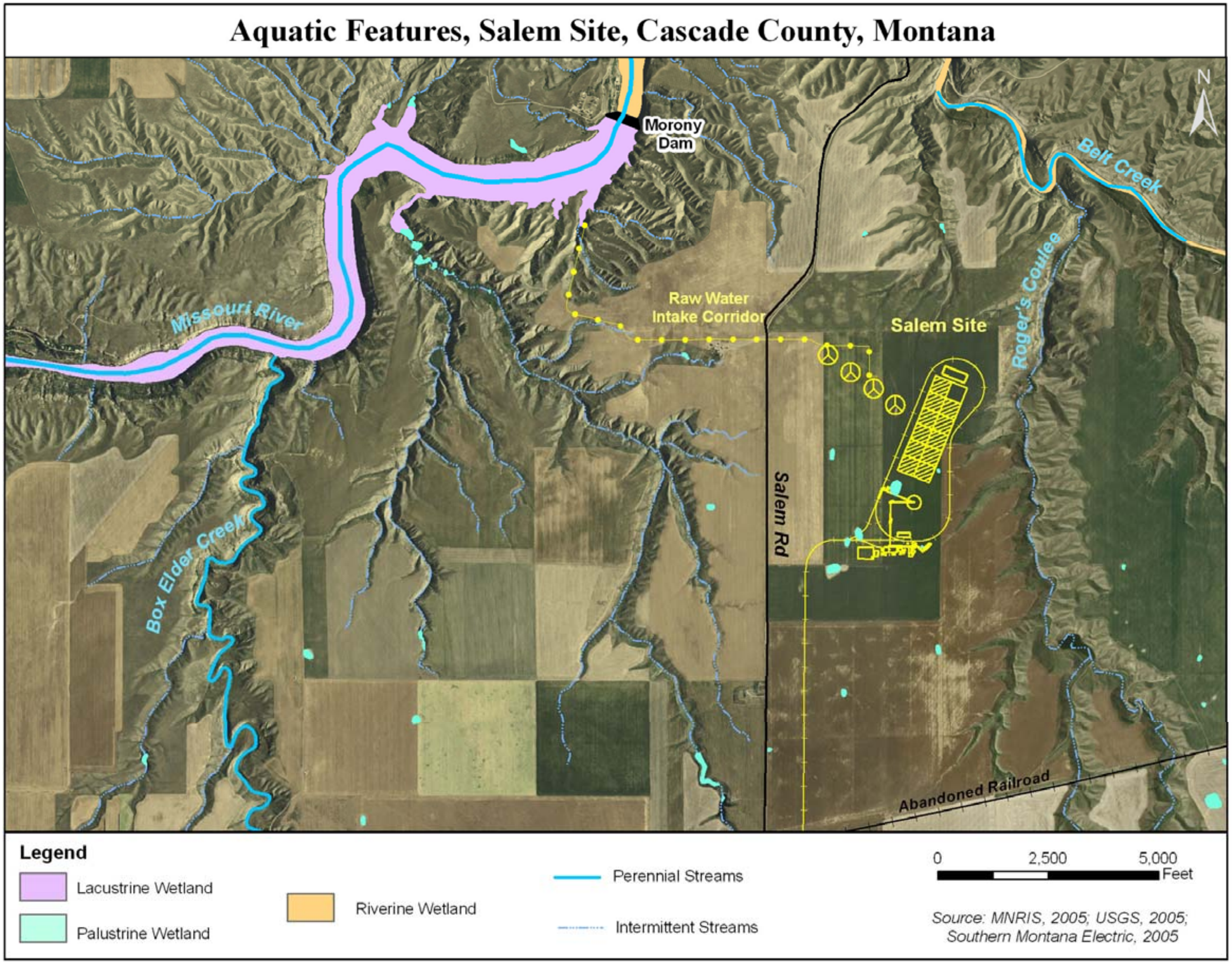


Figure 3-12. Aquatic Features of the Salem Site and Environs

3.2.9 INDUSTRIAL PARK SITE – SURFACE WATERSHEDS/AQUATIC FEATURES

The Industrial Park site also is located within the Upper Missouri River Basin and the Missouri-Sun-Smith River Sub-Basin. The site is located entirely within the Upper Missouri-Dearborn watershed.

Several unnamed drainages to the Missouri River are located immediately south and east of the site, and surface water flows in a south to southeast direction throughout this area, into the Missouri River. Lacustrine limnetic, lacustrine littoral, and riverine upper perennial wetlands are associated with the Missouri River, south and southeast of the site. A palustrine emergent wetland is located north-northwest of the site.

Lacustrine limnetic wetlands are associated with deep water while lacustrine litoral wetlands are shallow, extending from the shoreward boundary of the system to a maximum depth of 6.6 feet (2 m) below low water or to the maximum extent of nonpersistent emergents, if these grow at depths greater than 6.6 feet (2 m) (USGS, 1998).

Riverine perennial wetlands include all wetlands and deepwater habitats contained within a channel, provided they are not dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. Riverine wetlands often are immediately bounded on the landward side by upland or by the channel bank. Water flows consistently in these wetlands, and the water gradient is high and velocity of the water fast. The natural dissolved oxygen concentration is normally near saturation. The fauna is characteristic of running water, and there are few or no planktonic forms. The gradient is high compared with that of the lower perennial subsystem, and there is very little floodplain development.

Finally, palustrine emergent wetlands are nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2 m at low water; and (4) salinity due to ocean-derived salts less than 0.5 percent. Palustrine wetlands often are bounded by uplands, and their system of classification was developed to group the vegetated wetlands traditionally called by such names as marsh, swamp, bog, fen, and wet prairie, which are found throughout the United States. It also includes the small, shallow, permanent or intermittent water bodies often called ponds.

Figure 3-13 on the next page shows the primary aquatic and hydrological features of the landscape in the vicinity of the Industrial Park site. While the alternate power plant site is comprised almost entirely of upland habitats, it is within one mile (1.6 km) of the Missouri River itself; other hydrological features are still closer.

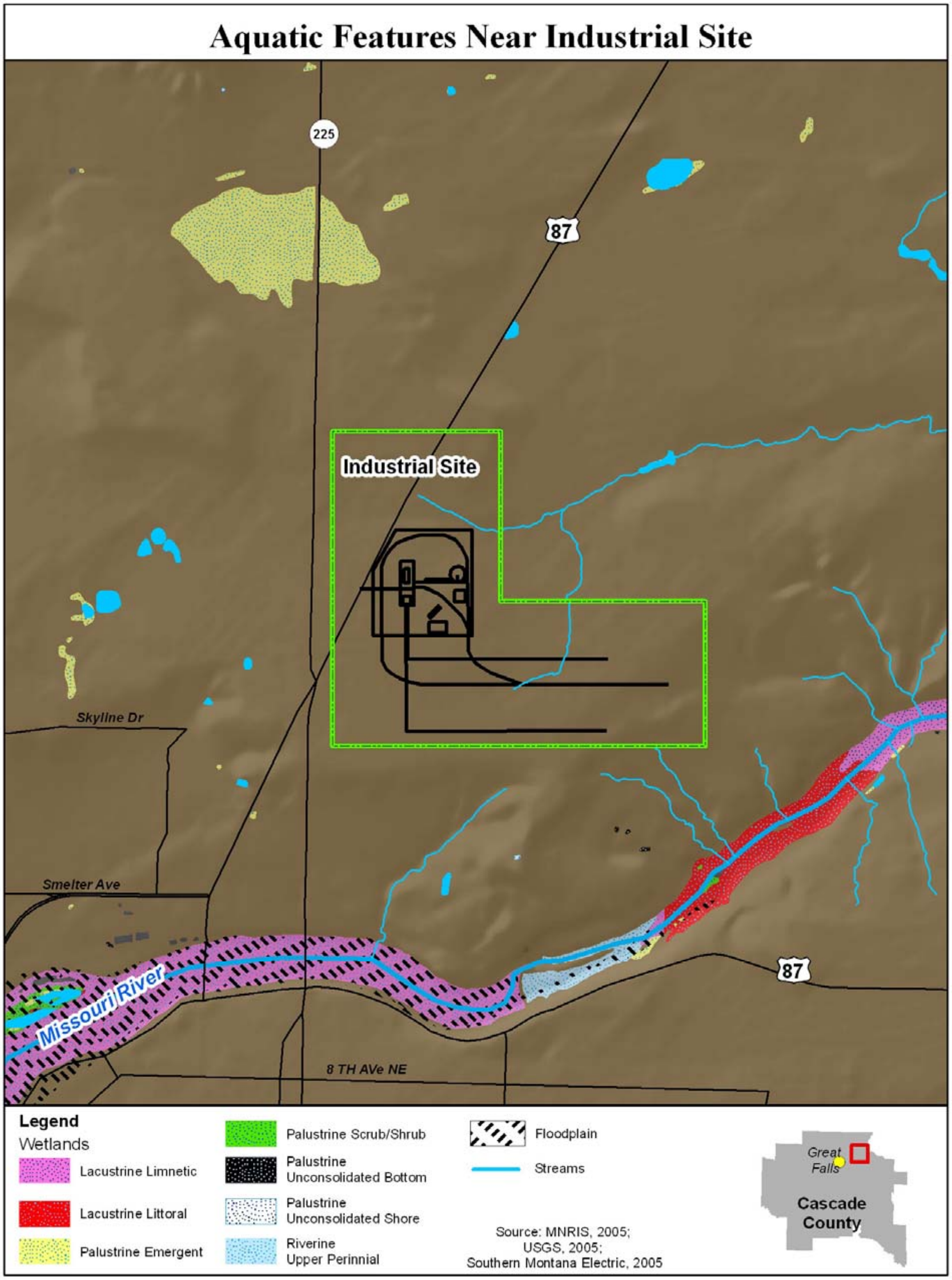


Figure 3-13. Aquatic Features of the Industrial Park Site and Environs

3.3 AIR QUALITY

3.3.1 LOCAL METEOROLOGY

Temperature and precipitation data for the project area were obtained from the Western Regional Climate Center (WRCC, 2006). These data include mean temperature and precipitation levels by month from 1971 through 2000. This 30-year period is the current standard for identifying long-term average temperature and precipitation levels in the United States.

Temperature and precipitation data were collected at the National Weather Service (NWS) station at the Great Falls airport. Precipitation data were also collected by the National Oceanic Atmospheric Administration (NOAA) Cooperative Observer Network at Highwood. The NOAA observers collect daily precipitation data, which are used to develop monthly normals. Temperature and precipitation data for Great Falls and Highwood are shown in Table 3-2.

Table 3-2. Great Falls and Highwood Temperature and Precipitation Summary/ Period of Record: 1971-2000

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ann.
Great Falls Airport Temperature (degrees F)													
Max	32.1	37.7	45.3	55.6	64.7	77.5	82.0	81.2	69.6	58.0	42.1	34.2	56.4
Min	11.3	15.1	21.5	29.7	38.3	46.0	50.4	49.9	41.2	33.0	22.5	14.4	31.1
Mean	21.7	26.4	33.4	42.6	51.5	60.0	66.2	65.6	55.4	45.5	32.3	24.3	43.7
Great Falls Airport Precipitation (inches)													
Max	1.68	1.21	2.09	4.63	5.20	5.18	4.68	4.90	3.23	3.43	1.44	1.92	5.20
Min	0.05	0.15	0.10	0.05	0.69	0.54	0.05	0.12	0.09	0.02	0.18	0.03	0.02
Mean	0.68	0.51	1.01	1.40	2.53	2.24	1.45	1.65	1.23	0.93	0.59	0.67	14.89*
Highwood 7NE Precipitation (inches)													
Mean	0.62	0.46	1.10	1.69	3.09	3.27	2.01	1.61	1.58	1.16	0.69	0.70	17.97*

Note: Total Annual Precipitation*
Source: WRCC, 2004

Wind conditions in the project area were determined from data collected by the National Weather Service (NWS) at the Great Falls airport. Figure 3-14 shows a wind rose depicting the wind patterns at the Great Falls airport for the years 1987-1991, the data period used for air dispersion modeling. The Great Falls wind rose shows dominant winds from the southwest with the highest wind velocities from that direction as well. The site only reported 1.21 percent calm winds.

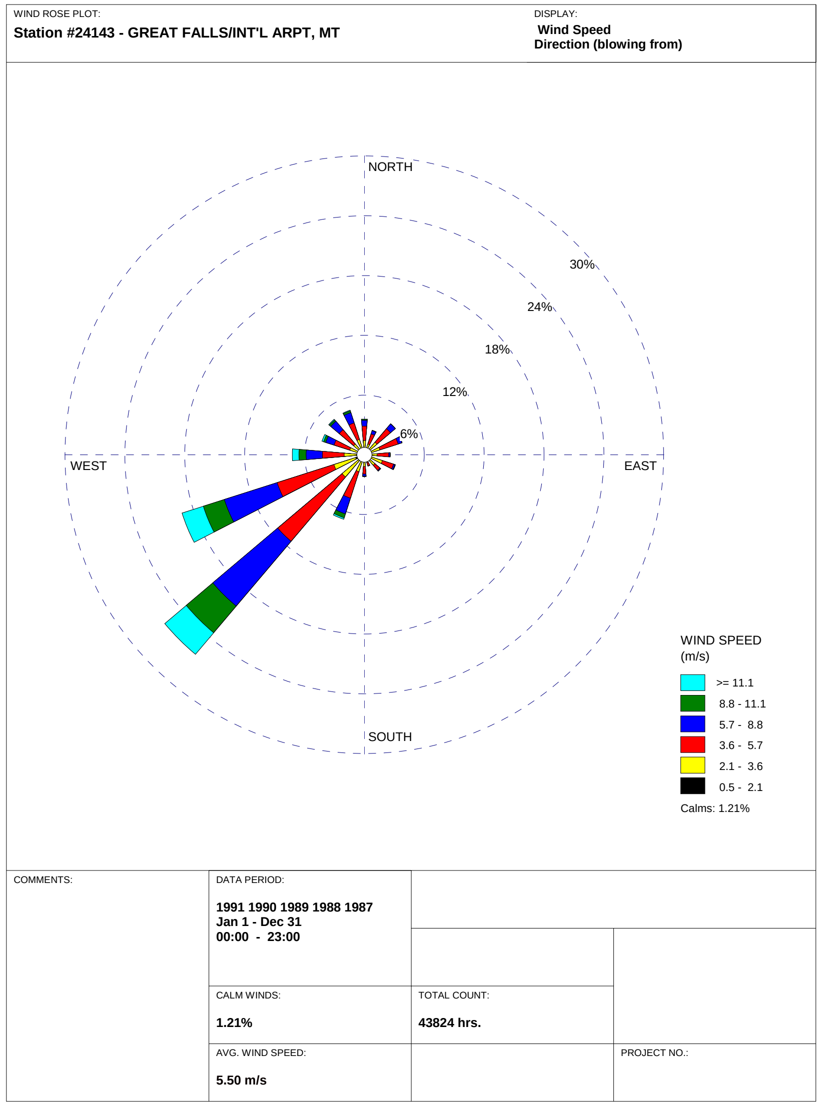


Figure 3-14. Great Falls NWS Station Wind Rose

3.3.2 TERMINOLOGY AND FEDERAL/STATE REGULATION OF AIR POLLUTANTS

Under the Federal Clean Air Act (CAA), as amended in 1970, 1977, and 1990, the United States Environmental Protection Agency (EPA) established primary standards to protect human health with an adequate margin of safety by setting maximum ambient air concentrations for seven threshold-value pollutants, or criteria pollutants (de Nevers, 2000). The six criteria pollutants, described below, are carbon monoxide (CO), ozone (O_3), nitrogen oxides (NOx), sulfur dioxide (SO_2), lead (Pb) and particulate matter (PM). NOx is composed primarily of nitric oxide (NO)

and nitrogen dioxide (NO_2) with lesser amounts of NO_3, N_2O, N_2O_3, N_2O_4 and N_2O_5. PM is regulated as PM_{10} (particulate matter less than or equal to 10 microns in equivalent aerodynamic diameter [diameter]) and $PM_{2.5}$ (particulate matter less than or equal to 2.5 microns in diameter).

> **Micron or Micrometer**
>
> The micron or micrometer is a unit of length in the metric system equal to one-thousandth (10^{-3}) of a millimeter or one-millionth (10^{-6}) of a meter. The abbreviation of the micron is µm.

PM is a mixture of small solid and liquid particles that are suspended in the atmosphere. Smoke and fly ash contain PM in a wide range of sizes, from 0.05 to 200 µm in diameter. As a basis of comparison, the width of a human hair ranges between 20 and 100 µm. PM is released through factory and utility smokestacks, vehicle exhaust, wood burning, construction activity, agriculture, and natural sources like volcanoes. PM also can form in the atmosphere when oxidized sulfur or nitrogen reacts to form aerosol particles. Such aerosols are called secondary fine particles, adding to PM levels in the atmosphere (DOE, 2003b). PM is regulated based on its size, with $PM_{2.5}$ regulated separately from PM_{10}. $PM_{2.5}$ particles, which can be carried much farther and higher than larger particles (like PM_{10}), are more likely to carry heavy metals and cancer-causing organic compounds into the alveoli, the deepest and most susceptible part of the lungs, and thus are more stringently regulated (Davis and Cornwell, 1998).

CO is a colorless, odorless gas formed during combustion. CO is a product of incomplete combustion of carbon and is emitted during nearly all combustion activities. CO reacts with hemoglobin in the blood to form carboxyhemoglobin, effectively depriving the body of oxygen. Oxygen deprivation impairs perception and thinking, slows reflexes and causes drowsiness. Prolonged exposure to high levels of CO, particularly in those who have heart and circulatory ailments, can cause unconsciousness or even death.

Nitrogen oxides are formed during combustion, either by the oxidation of nitrogen in fuel or by the reaction of atmospheric nitrogen (typical air content is about 80 percent nitrogen or N_2) and oxygen (O_2) in the high temperatures of combustion. A small portion of NOx from combustion is emitted as NO_2. Most NOx emissions from combustion are NO, some of which eventually oxidizes to NO_2 in the ambient air. State and federal ambient air quality standards for NOx are based on NO_2.

Nitrogen oxides are one of the precursors to acid rain. Over time, NO in the atmosphere can react with water (H_2O) to form nitric acid (HNO_3). Nitric acid can form fine particles that remain suspended in the air or fall to the earth in the form of rain, snow, or fog. Acid rain (sometimes called acid precipitation or deposition) can cause soils, lakes and streams to become acidic, adversely affecting the ecosystem. Additionally, acid rain causes deterioration of cars, buildings, and irreplaceable historic monuments.

Nitrogen oxides also contribute to PM concentrations in the atmosphere, as NO_x particles react with ammonia, moisture, and related particles. Exposure to nitrogen oxides also can result in coughing and irritation of the respiratory tract, or in more severe cases, in difficulty breathing, damage to lung tissue, or premature death (EPA, 2003a). Nitrous oxide (N_2O) is also a potent greenhouse gas. Greenhouse gases are discussed further in Section 3.3.6.

SO_2 is formed through the oxidation of bound sulfur found in all organic fuels used by humans, including oil, coal, natural gas, peat, and wood. Sulfur dioxide also is released from volcanoes and decaying plants. As with nitrogen oxides, sulfur dioxide is a precursor to acid rain. Oxidized sulfur reacts with H_2O to form sulfuric acid (H_2SO_4). Sulfuric acid then falls to the earth in the form of rain, snow, or fog. SO_2 also reacts with other atmospheric chemicals to form tiny sulfate particles, which contribute to PM concentrations. Such particles can gather in the lungs and cause respiratory symptoms and disease, difficulty in breathing, and premature death (EPA, 2003b). Furthermore, these aerosols are a major cause of the visibility impairment that interferes with views of scenery in national parks and mountain ranges like the Appalachians.

O_3 is a strong photochemical oxidant that is formed when NO reacts with volatile organic compounds (VOC's, also referred to as hydrocarbons (HC)) and oxygen in the presence of sunlight. Ozone is considered a secondary pollutant because it is not directly emitted from pollution sources but is formed in the ambient air.

Ozone exposure can lead to eye irritation at concentrations above 0.1 parts per million (ppm). Coughing and chest discomfort are caused at concentrations of 0.3 ppm (Davis and Cornwell, 1998). Ozone impairs lung function and reduces resistance to colds and diseases such as pneumonia. Ozone plays a role in bronchitis, emphysema, asthma, and heart disease (NDEQ, 2002). With long-term exposure, ozone may cause permanent lung damage. In addition, high levels of ozone have been documented to damage certain trees, plants, and crops.

Additional Air Quality Concerns

In addition to the six criteria pollutants outlined in the CAA, several other substances raise concerns with regard to air quality. Four of these elements and chemical compounds are briefly discussed below:

Mercury (Hg)

A toxic heavy metal that is a byproduct of the combustion of fossil fuels, especially coal. Mercury can accumulate in the environment and is highly toxic to humans and animals if inhaled or swallowed. Exposure can permanently damage the brain, kidneys, and fetuses (EPA, 2003d).

Carbon Dioxide (CO_2)

Burning fossil fuels releases carbon that has been stored underground for tens of millions of years into the atmosphere in the form of carbon dioxide, the dominant gas contributing to an enhanced greenhouse effect. Equilibrium in the natural carbon cycle is disrupted when large amounts of carbon dioxide are released to the atmosphere by human activities, such as the burning of fossil fuels (EPA, 2003d).

Methane (CH_4)

Methane (CH_4) also is a greenhouse gas that traps heat in the atmosphere. A molecule of methane is estimated to be 21 times more potent as a greenhouse gas than a molecule of carbon dioxide. Over the last two centuries, methane's concentration in the atmosphere has more than doubled due to increasing methane emissions from human activities, including placing municipal solid waste in landfills, producing natural gas and petroleum, mining coal, burning fossil fuels, and as a byproduct of large scale cattle and domestic animal operations (EPA, 2003d).

Volatile Organic Compounds (VOCs)

Also known as hydrocarbons, VOCs are liquids or solids that contain organic carbon, and that readily vaporize. VOCs participate in the smog reaction and also contribute to the formation of secondary pollutants in the atmosphere, including ozone. Some VOCs are toxic and carcinogenic (most are not), while some add to global warming (de Nevers, 2000).

Lead (Pb) is a highly toxic metal that is emitted by industrial processes (including smelters and power plants) and resides in the atmosphere as particulate matter. Pb affects the brain, nerves, heart, and blood, and can lead to seizures, mental retardation, behavioral disorders, memory problems, kidney and liver damage, heart disease, anemia and mood changes. Infants and young children are especially vulnerable to lead exposure (EPA 2003c).

Table 3-3 lists the health and environmental effects of criteria pollutants in more detail.

Regulation of Criteria Pollutants

The Clean Air Act gives the states (e.g. Montana) the primary authority to manage their air quality resources. However, to ensure a certain amount of consistency from state to state, EPA requires air pollution control agencies to develop control plans based on broad Federal statutes and regulations. The overall control strategy is called the State Implementation Plan (SIP), which includes, among other programs, orders, and control plans, the Montana Air Quality Permitting Program under ARM 17.8.740 *et seq.* and the major New Source Review (NSR) Permitting Program, under ARM 17.8.801 *et seq.* and 17.8.901-906. The Montana Clean Air Act (75-2-101 *et seq.*, MCA) provides the means through which the federal CAA is implemented in Montana. Pursuant to the Montana CAA, an air quality permit is required from DEQ for the construction, installation, alteration, or use of equipment or facilities that may cause or contribute to air pollution. Section 4.5.2.2.1 discusses the regulatory requirements in greater detail. Appendix I contains the DEQ's supplemental preliminary determination on the air quality permit for SME-HGS (DEQ, 2006a).

State Implementation Plan

SIPs generally establish limits or work practice standards to minimize emissions of the criteria air pollutants or their precursors. The Proposed Action must meet the requirements of the Montana SIP.

New Source Review Permitting Program

Congress established the NSR permitting program as part of the 1977 Clean Air Act Amendments. NSR is a preconstruction permitting program that serves two important purposes:

- First, it ensures that air quality is not significantly degraded from the addition of new and modified factories, industrial boilers and power plants. In areas with unhealthy air, NSR assures that new emissions do not slow progress toward cleaner air. In areas with clean air, especially pristine areas like national parks, NSR assures that new emissions do not significantly worsen air quality.

- Second, the NSR program assures people that any large new or modified industrial source in their neighborhoods will be as clean as reasonably possible, and that advances in pollution control occur concurrently with industrial expansion.

Table 3-3. General Sources and Health/Environmental Effects of Criteria Pollutants

Pollutant	Description	Sources	Effects
Carbon Monoxide (CO)	An odorless, tasteless, colorless gas which is emitted primarily from any form of combustion	Carbon black manufacture Refineries Oil and gas liquids Mobile sources Other combustion sources Open burning	Deprives the body of oxygen by reducing the blood's capacity to carry oxygen, causes headaches, dizziness, nausea, listlessness, and in high doses, death
Ozone (O_3)	A toxic gas associated with photochemical smog, formed when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react together in the presence of sunlight and warm temperatures	VOCs and NO_x from: -Fossil fuel power plants -Refineries -Natural gas transmission -Chemical manufacture -Mobile sources (i.e. vehicle tailpipe exhaust)	Irritates eyes, nose, throat and respiratory system; especially bad for those with chronic heart and lung disease, as well as the very young, old, and pregnant women
Particulate Matter (PM_{10} and $PM_{2.5}$)	Respirable particles less than 10 µm and 2.5 µm (microns) in size	Paper industry Fugitive dust Construction activities Fossil fuel power plants Other combustion sources Open burning	Aggravates ailments such as bronchitis and emphysema, especially bad for those with chronic heart and lung disease, as well as the very old, young, and pregnant women
Sulfur Dioxide (SO_2)	A pungent, colorless gas that combines with water vapor to become sulfurous acid, a mildly corrosive compound; when sulfurous acid combines with oxygen, it produces sulfuric acid (H2SO4), a very corrosive and irritating chemical	Inorganic chemical manufacture Refineries Calciners Fossil fuel power plants	Increases risk of adverse reactions in asthmatic patients, irritates respiratory system; harmful to plants; dissolves stone and corrodes iron and steel; causes "acid rain" which harms water bodies and aquatic life
Nitrogen Dioxide (NO_2)	A poisonous gas produced when nitrogen oxide is a byproduct of sufficiently high- temperature combustion	Combustion processes: -Fossil fuel power plants -Motor vehicles -Industry -Fertilizer manufacturing -Oil and gas development	Harmful to lungs; irritates bronchial and respiratory systems; increases symptoms in asthmatic patients; precursor to ozone
Lead (Pb)	A widely-used metal that may accumulate in the body	Secondary smelting and refining of nonferrous metals; Steel works Blast furnaces	Disturbs motor function and reflexes; impairs learning, causes intestinal disease, anemia, and damage to the central nervous system, kidneys, and brain; children most vulnerable

NSR permits are legal documents by which the facility owners/operators must abide. The permit specifies what construction is allowed, what emission limits must be met, and often how the emissions source may be operated. NSR requires stationary sources of air pollution to get permits before they start construction. NSR is also referred to as construction permitting or preconstruction permitting.

There are three types of NSR permitting requirements. A source may have to meet one or more of these permitting requirements. The three types of NSR requirements are:

1. Prevention of Significant Deterioration (PSD) permits which are required for new major sources or a major source making a major modification in an attainment area (ARM 17.8.801 *et seq.*).

2. Non-attainment NSR permits which are required for new major sources or major sources making a major modification in a non-attainment area (ARM 17.8.901-906); and

3. Minor source permits.

Hazardous Air Pollutants (HAPS)

HAPs, also known as air toxics, are those pollutants that are known or suspected to cause cancer or other serious health or environmental effects (EPA Toxics). HAPs are emitted in much lower quantities than the more common criteria air pollutants and are generally not found in the ambient environment in measurable amounts. EPA has identified 188 HAPs, which are included on the Hazardous Air Pollutants List (as defined in Section 112(b) of the CAA). The formation and emissions of HAPs from industrial sources are regulated through the National Emission Standards for Hazardous Air Pollutants (NESHAPs).

Section 112 of the Clean Air Act requires regulations for HAPs. Until EPA's mercury regulations were finalized in 2005, reductions of mercury emissions from electric generating units were being addressed through the HAP regulations. Any new plant that could be a major source for mercury had to undergo a case-by-case technology review. This analysis was referred to as a 112(g) preconstruction approval and was implemented by state agencies like DEQ through federally-approved state rules.

The main HAPs emissions of concern from the proposed power plant are mercury (Hg), hydrogen chloride (HCl), hydrogen fluoride (HF), trace metals and radionuclides (including radon). DEQ performed Best Available Control Technology (BACT) analyses for these HAPs during the SME air quality permit application review.

3.3.3 AIR QUALITY IN CLASS II AREAS

As mentioned in Section 3.3.2, for criteria air pollutants, air quality is described by the concentration of various pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing the concentration in the atmosphere to applicable national and/or state ambient air quality standards. These standards represent the maximum

allowable atmospheric concentrations that may occur and still protect public health and welfare with a reasonable margin of safety. The U.S. EPA has established the National Ambient Air Quality Standards (NAAQS) described above. The PSD permitting program establishes PSD Increments, which are maximum allowable increases in air contaminant concentrations in attainment or unclassified areas. The Montana Board of Environmental Review has also established Montana Ambient Air Quality Standards (MAAQS). The NAAQS, MAAQS, and PSD Increments for criteria air pollutants are provided in Table 3-4.

Table 3-4. NAAQS, MAAQS, and PSD Increments

Pollutant	Averaging Period	NAAQS[1] (μg/m³)	MAAQS[2] (μg/m³)	PSD Class II Increment[3] (μg/m³)
PM_{10}	Annual	--	50	17
	24-hour	150	150	30
PM2.5	Annual	15	--	NA
	24-hour	35	--	NA
NO_2	Annual	100	94	25
	1-hour	--	564	
SO_2	Annual	80	52	20
	24-hour	365	262	91
	3-hour	1300	--	512
	1-hour	--	1300	
CO	8-hour	10,000	10,000	--
	1-hour	40,000	26,000	--
Ozone	1-hour	--	196	--
	8-hour	157	--	--
Pb	Quarterly	1.5	--	--
	90-day	--	1.5	--

[1] Code of Federal Regulations Title 40 Part 50.
[2] Administrative Rules of Montana (ARM) 17.8.201-230
[3] Administrative Rules of Montana (ARM) 17.8.804.

The NAAQS and MAAQS generally are defined as the maximum acceptable ground level concentrations that may be exceeded once per year, except that annual standards may never be exceeded and the 1-hour average MAAQS for SO_2 may not be exceeded more than 18 times in any consecutive 12 months.

The PSD Increments are pollutant-specific ambient air concentrations above an ambient air baseline concentration that may be exceeded once per year, except that annual standards may never be exceeded. The baseline concentration is defined for each pollutant and is the ambient concentration existing at the time that the first PSD application affecting an area is submitted.

The PSD program was established to prevent areas where the ambient air is currently in attainment with the NAAQS from degrading such that ambient air concentrations rise above the NAAQS. Attainment means that the maximum concentrations of the particular criteria pollutant

in the area are less than the NAAQS. Nonattainment means that maximum concentrations of the particular criteria pollutant in the area are above the NAAQS. Nonattainment designations are further categorized as serious nonattainment and moderate nonattainment. At this time, the air quality classification for the Cascade County area is "Better than National Standards" or Unclassifiable/Attainment for the NAAQS (40 CFR 81.327).

Air pollutants of most concern in the Great Falls area are SO_2 and CO. The primary source of SO_2 emissions is the Montana Refining Company (MRC) petroleum refinery. Dispersion modeling performed on behalf of MRC has been used to identify an area of potential concern where MRC is required to operate an SO_2 ambient air quality monitor (DEQ, 2003a). Ambient CO monitors have measured elevated CO concentrations near major intersections in Great Falls in the past. CO data are still being collected in Great Falls near high traffic areas to ensure that the CO concentrations do not exceed ambient standards.

$PM_{2.5}$ data are being collected in most major population centers in Montana, including Great Falls. $PM_{2.5}$ monitoring began at Great Falls High School on January 1, 2000. This site is in a residential neighborhood near the city's center. Fine particulate is the pollutant most likely to accumulate and become troublesome during stagnant conditions so the values coming from this site provide an excellent measure of air quality in Great Falls (DEQ, 2003a).

Ambient air quality data collected in Great Falls have been reported to EPA and are listed in Table 3-5.

Table 3-5: Cascade County Monitoring Data

Pollutant	Avg. Period	Monitored Concentration ($\mu g/m^3$)	NAAQS	MAAQS
PM_{10} (1)	24-hr	23 $\mu g/m^3$	150 $\mu g/m^3$	150 $\mu g/m^3$
	Annual	7 $\mu g/m^3$	---	50 $\mu g/m^3$
$PM_{2.5}$ (2)	24-hr	12 $\mu g/m^3$	35 $\mu g/m^3$	---
	Annual	4.5 $\mu g/m^3$	15 $\mu g/m^3$	---
SO_2 (2)	24-hr	0.025 ppm	0.14 ppm	0.10 ppm
	Annual	0.003 ppm	0.03 ppm	0.02 ppm
CO (2)	1-hr	3.7 ppm	35 ppm	23 ppm
	8-hr	2.0 ppm	9 ppm	9 ppm

(1) PM_{10} Data Collected by SME at the Project Site in 2004/2005.
(2) USEPA, Air Data, County Air Quality Report, Criteria Air Pollutants. Accessed at www.epa.gov, May 11, 2006.

Existing air quality in Cascade County is impacted by existing industrial sources as well as area source activities such as vehicles, road dust, residential wood burning and agriculture. Table 3-6 contains a list of major industrial sources in the Great Falls area along with the reported 2004 emissions from existing sources and permitted allowable emissions from proposed sources.

Table 3-6. Six Cascade County Major Industrial Emissions Sources

Facility Name	Type of Source	Actual Emissions[1]	
Montana Ethanol Project	Proposed Ethanol Plant	CO – 154 tpy VOC – 96.0 tpy PM_{10} – 147 tpy	NO_x – 189 tpy SO_2 – 10.0 tpy
International Malting Company	Malting Plant	CO – 78.9 tpy VOC – 5.16 tpy PM_{10} – 60.4 tpy	NO_x – 69.2 tpy SO_2 – 37.1 tpy
Malmstrom Air Force Base	Heating Boilers	CO – 17.7 tpy VOC – 0.54 tpy PM_{10} – 1.27 tpy	NO_x – 28.0 tpy SO_2 – 37.1 tpy
Montana Megawatts I, LLC	Proposed Gas-fired Power Plant	CO – 95.2 tpy VOC – 22.0 tpy PM_{10} – 99.1 tpy	NO_x – 98.4 tpy SO_2 – 11.4 tpy
Montana Refining Company	Petroleum Refinery	CO – 40.6 tpy VOC – 279 tpy PM_{10} – 13.0 tpy	NO_x – 190 tpy SO_2 – 782 tpy
Highwood Generating Station	Proposed Coal-Fired Power Plant	CO – 1177 tpy VOC – 38 tpy PM_{10} – 366 tpy	NO_x – 944 tpy SO_2 – 443 tpy

Note: [1] 2004 Emissions reported to DEQ for existing sources. Permitted allowable emissions for proposed sources.
Source: Data compiled from DEQ records.

3.3.4 AIR QUALITY IN CLASS I AREAS

In accordance with applicable requirements of the federal CAA and the Administrative Rules of Montana (ARM), potential impacts on the PSD Class I increments in all Class I areas and Air Quality Related Values (AQRVs) in federal mandatory Class I areas are required to be assessed for PSD projects. Federal mandatory Class I Areas, as defined in the CAA, are national parks over 6,000 acres (2,428 ha), national wilderness areas and national memorial parks over 5,000 acres (2,023 ha), and international parks that were in existence as of August 7, 1977. Three Indian reservations in Montana have been redesignated as a Class I areas, but are not mandatory or federal Class I areas. All of the Class I reservations are located outside the area that would be impacted by the Proposed Action. Table 3-7 documents the federal mandatory Class I areas within 250 km of the proposed project site and Figure 3-16 displays their location on a map of Montana.

AQRV's are resources, as identified by the Federal Land Managers (FLMs) for one or more federal mandatory Class I areas, which may be adversely affected by a change in air quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the FLMs for a particular area that is affected by air quality. While the sensitivity of an AQRV to air pollution may be known, the long term monitoring of its

health or status may not have been accomplished. Figures 3-15 and 3-17 are scenes from two of the Class I areas in Table 3-7.

Table 3-7. Federal Mandatory Class I Areas Considered

Class I Area	**Distance from Proposed Site miles (km)**
Gates of the Mountains Wilderness Area (GMW)	53 (86)
Scapegoat Wilderness Area (SGW)	73 (118)
Bob Marshall Wilderness Area (BMW)	80 (129)
Glacier National Park (GNP)	114 (184)
Mission Mountain Wilderness Area (MMW)	124 (199)
UL Bend Wilderness Area (ULBW)	134 (215)
Anaconda Pintler Wilderness Area (APW)	142 (228)

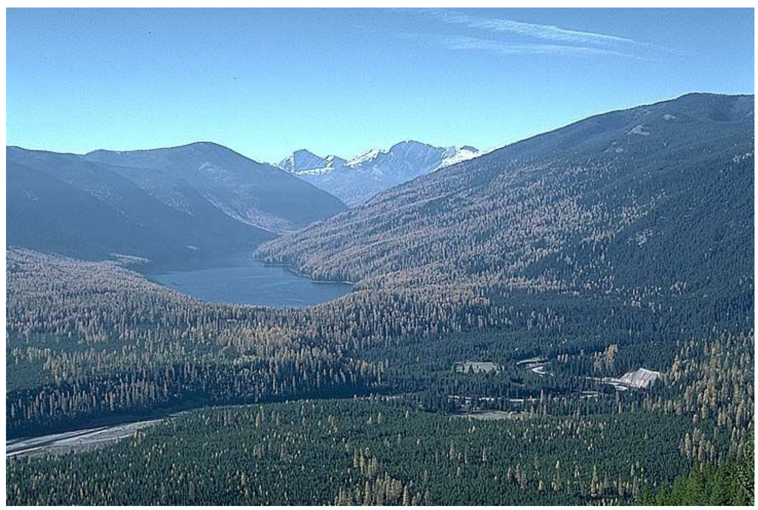


Figure 3-15. Class I Area: Big Salmon Lake in Bob Marshall Wilderness Area

The PSD Class I increments are defined as the maximum allowable increase in pollutants over baseline concentrations in Class I areas. The PSD Class I increment demonstration can be performed in a two-step process. In the first step, the highest modeled impacts from a proposal are compared to the EPA proposed Class I increment significance levels that were established as four percent of the corresponding Class I increments. If the impacts from a proposal are below the significance levels, the Class I increments demonstration is complete and no further analysis is necessary. If any significance levels for applicable pollutant(s) are exceeded, a cumulative impact analysis should be conducted for all averaging periods with modeling results that exceed the significance levels. The cumulative analysis should include impacts from the project and other PSD-major sources in the surrounding area that could impact the Class I area. Table 3-8 lists the EPA proposed Class I significance levels and the Class I PSD increments.

Under the regulations promulgated for visibility protection (40 CFR §51.301 and ARM 17.8.1101(3)) visibility impairment is defined as "…any humanly perceptible change in visibility (visual range, contrast, coloration) from that which would have existed under natural conditions." Visibility can be affected by plume impairment (heterogeneous, visual plume) or regional haze (homogeneous). Plume impairment results from a contrast or color difference between a plume and a viewed background such as the sky or a terrain feature. Plume

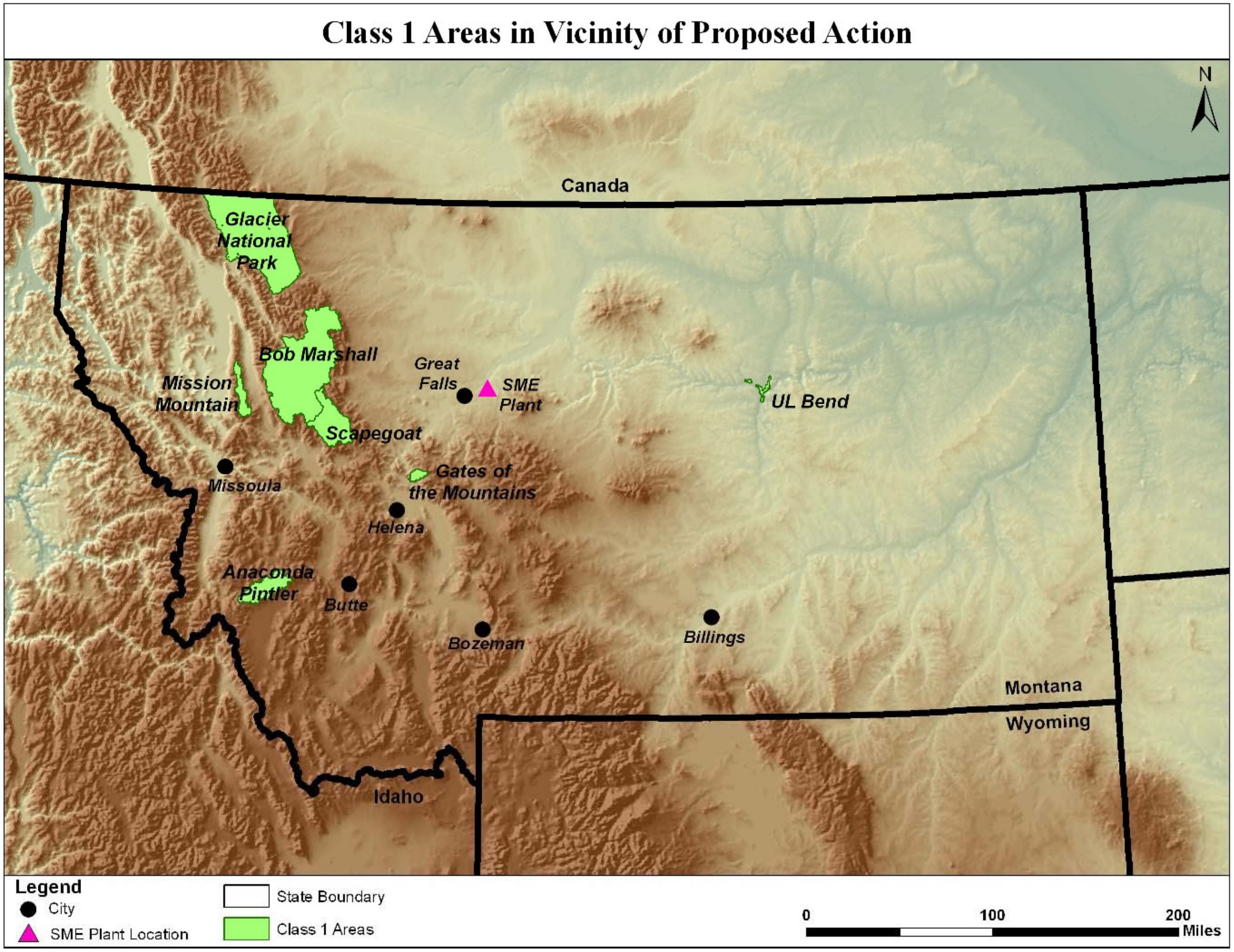


Figure 3-16. Federal Mandatory Class I Air Quality Areas Within 250 Km of the Proposed SME CFB Power Plant

Table 3-8. PSD Class I Significance Levels and Increments

Pollutant	Averaging Period	EPA Proposed Class I Significance Level (μg/m^3)	Class I Increment (μg/m^3)
Nitrogen Dioxide (NO_2)	Annual	0.1	2.5
Sulfur Dioxide (SO_2)	Annual	0.1	2
	24-hour	0.2	5[a]
	3-hour	1.0	25[a]
PM_{10}	Annual	0.2	4
	24-hour	0.3	8[a]

[a] Not to be exceeded more than once per calendar year

Figure 3-17. Class I Area: Glacier National Park's St. Mary Lake with Wild Goose Island

impairment is only a concern in cases where the federal mandatory Class I area is within a 50-kilometer (km) (31-mile) distance from the source, so that minimal dispersion of the plume occurs before reaching the Class I area.

Regional haze occurs at distances (over 50 km) where the plume has become evenly dispersed in the atmosphere and there is no definable plume. The primary causes of regional haze are sulfates and nitrates (primarily as ammonium salts), which are formed from SO_2 and NO_X through chemical reactions in the atmosphere. These reactions take time, such that near a source little NO_X or SO_2 will have formed nitrate or sulfate, whereas far from a source nearly all SO_2 will have formed sulfate and most NO_X will have formed nitrate.

For this proposed action, the evaluated AQRVs for the federal mandatory Class I areas within a 250-km radius of the proposed site include:

- Visibility – Visual Plume
- Visibility – Regional Haze
- Acid Deposition

Note that these AQRVs are not air quality standards for specific pollutants like the NAAQS. The fundamental methods and criteria for determining and interpreting impacts to federal mandatory Class I areas are set forth in several EPA and FLM documents, including –

- Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Report, December 1998 (IWAQM, 1998)
- FLMs' Air Quality Related Values Workgroup (FLAG) Phase I Report , December 2000 (FLAG, 2000)

- National Park Service (NPS) and U.S. Forest Service (USFS) guidance

EPA-approved dispersion models/programs are used to evaluate visibility and acid deposition impacts. The analyses use the FLM-established thresholds of visibility degradation measured in 24-hour light extinction change to evaluate source impacts to regional haze (far-field/multisource impacts), EPA-established criteria for visual plume impacts (near-field impacts), and the FLM-established annual Deposition Analysis Thresholds (DAT) for acid deposition. DAT for total nitrogen and total sulfur deposition are each 0.005 kilogram per hectare per year for the western United States. Impacts higher than these levels trigger the requirement for additional analyses.

Regional haze is measured using the light extinction coefficient (b_{ext}). The percentage change in the light extinction coefficient (Δb_{ext}) attributable to a particular project with respect to the background light extinction is used to determine the regional haze impacts from that project. The Δb_{ext} value attributable to a project that is generally considered to be acceptable is five percent on a 24-hour average basis. A predicted change in extinction between five percent and 10 percent may require a cumulative analysis that includes impacts from other nearby stationary sources.

It is important to note that the decision thresholds for AQRVs are not absolute. The FLM and DEQ are required to make a determination on a "…case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments…" (40 CFR §51.301 and ARM 17.8.1101(2)). However, the decision thresholds are useful as an initial benchmark for analysts to judge whether a proposed action would have an adverse impact on visibility and deposition and whether the FLM would be likely to object to a proposed action.

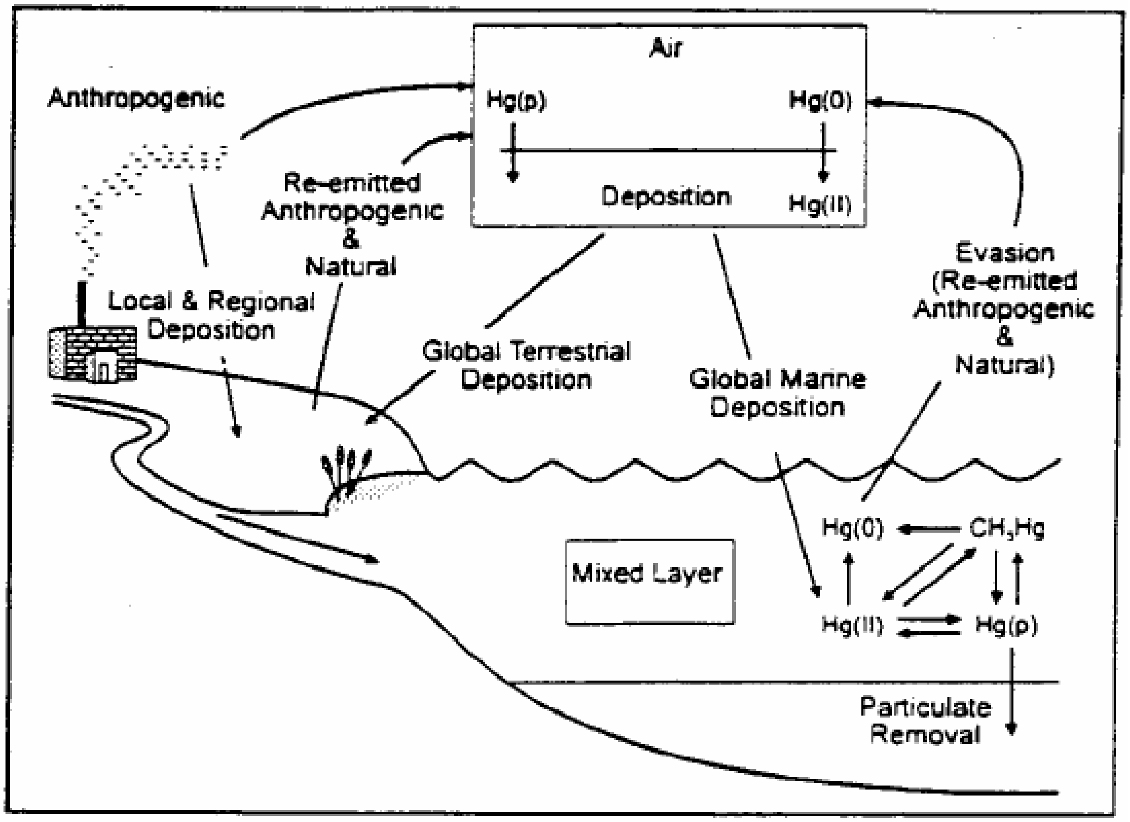
FLMs rely on the best scientific information available in the published literature and best available data to make informed decisions regarding levels of pollution likely to cause adverse impacts. They consider specific agency and Class I area legislative mandates in their decisions and, in cases of doubt, "err on the side of protecting the AQRVs for future generations" (Senate Report No. 95-127, 95th Congress, 1st Session, 1977). For air quality dispersion modeling analyses, FLMs follow 40 CFR §52.21(l) (Appendix W of 40 CFR Part 51, EPA's *Guideline on Air Quality Models*) and the recommendations of the IWAQM. FLMs allow modeling analyses conducted on a case-by-case basis considering types and amount of emissions, location of source, and meteorology. When reviewing modeling and impact analysis results, the FLMs consider frequency, magnitude, duration, and location of impacts.

3.3.5 MERCURY IN THE ENVIRONMENT

Background

At typical temperatures and pressures, elemental mercury (Hg) is a heavy, silver-white liquid metal (EPA, 1997c). Mercury is also a hazardous air pollutant and a high-priority concern for the U.S. EPA (Abbott, 2005) and Montana DEQ (AP, 2006a). As a chemical element common in the earth's crust (Levin, 2001), mercury can neither be created nor destroyed. However, mercury can cycle through the environment – including air, land and water – as part of both natural and human (anthropogenic) activities (Figure 3-18). Measured data and modeling results both

Figure 3-18. The Global Mercury Cycle



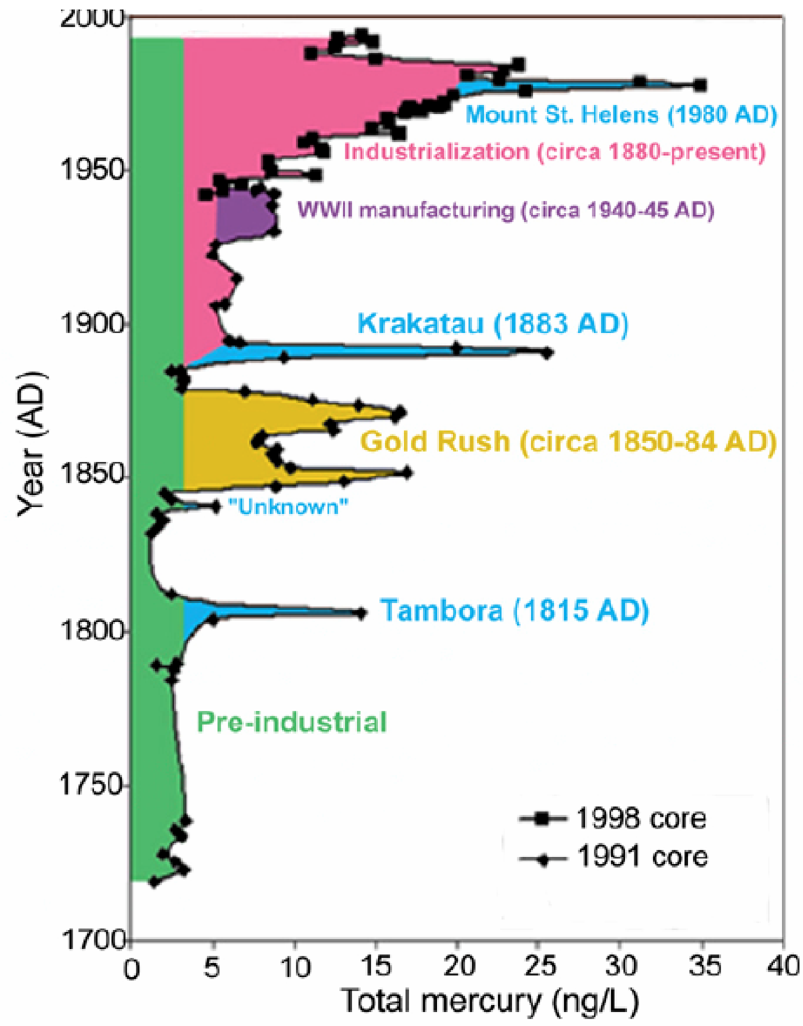
Source: EPA, 1997c

indicate that the amount of mercury mobilized and released into the biosphere has increased since the beginning of the industrial age (EPA, 1997a). Figure 3-19 is a graph displaying a profile of historic concentrations of mercury developed from an age-dated, 160-m (530-ft) deep ice core from the Upper Fremont Glacier in Wyoming's Wind River Range (Abbott, 2004). Increasing background mercury deposition from the atmosphere is evident, with occasional spikes in concentration caused by volcanic eruptions.

Mercury plays an important role as a process or product ingredient in several industrial sectors. It has also been used in many household products, including thermometers, lamps, paints, batteries, electrical switches, pesticides, and even toys and shoes (Ohio EPA, 2000). In the electrical industry, it is used in components such as fluorescent lamps, wiring devices and switches (e.g., thermostats) and mercuric oxide batteries. Furthermore, it is a component of dental amalgams used in repairing dental caries (cavities). In addition to specific products, mercury is utilized in numerous industrial processes, the largest of which in the U.S. is the production of chlorine and caustic soda by mercury cell chlor-alkali plants (EPA, 1997a).

Mercury can exist in three different oxidation or valence states: Hg^0 (metallic or elemental), Hg^+ (mercurous) and Hg^{2+} (mercuric). The properties and behavior of mercury depend on its oxidation state. Elemental mercury is a liquid but also has a fairly substantial vapor pressure, meaning that mercury vapor will be present at normal environmental temperatures. Mercurous

Figure 3-19. Historic Mercury Concentrations from 160-m Ice Core in Upper Fremont Glacier, Wind River Range, Wyoming



Source: Abbott, 2004
ng/L = nanograms (billionths of a gram) per liter

and mercuric forms of mercury generally exist as solids in combination with other chemicals and do not have a measurable vapor pressure. Mercury can also be combined with organic molecules (primarily by bacteria in sediments) to form organic mercury compounds.

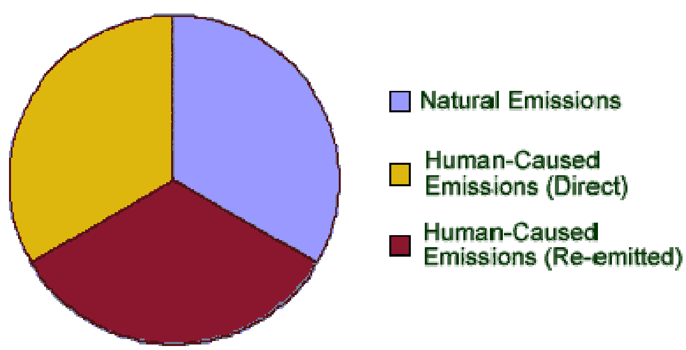
The most dominant form of mercury in the atmosphere is elemental or metallic mercury (Hg^0), which is present as mercury vapor. Reactions with other chemicals and solar radiation in the atmosphere can convert elemental mercury to ionic or charged forms (Hg^{2+}, Hg^+). Most of the mercury occurring in water, soil, sediments, or biota (i.e., all environmental media except the atmosphere) is in the form of inorganic mercury salts and organic forms of mercury (EPA, 1997a).

Mercury Emissions and Deposition

Scientists estimate that natural sources of mercury – such as volcanic eruptions, forest fires, and emissions from the ocean – constitute roughly a third of current worldwide mercury air emissions (EPA, 2006a). Mercury emissions can originate from natural sources such as geysers and hot springs in Yellowstone National Park. Recent measurements have shown that Yellowstone's Norris and Mammoth thermal areas are emitting mercury to the air at the rate of 205-450 lbs/year (93-205 kg/yr) (NPS, 2005).

Anthropogenic sources account for the other two-thirds of mercury emissions. Recent estimates of annual total global mercury emissions from all sources, both natural and anthropogenic, are about 4,400 to 7,500 metric tons per year. Much of the mercury circulating through today's environment was released years ago, when mercury was more commonly used than at present in many industrial, commercial, and residential applications. Land and water surfaces can repeatedly re-emit mercury into the atmosphere after its initial release into the environment (refer to Figure 3-18). Figure 3-20 below shows that anthropogenic emissions are roughly split evenly between these re-emitted emissions from previous human activity, and direct emissions from current human activity (EPA, 2006a).

Figure 3-20. Sources of Global Mercury Emissions

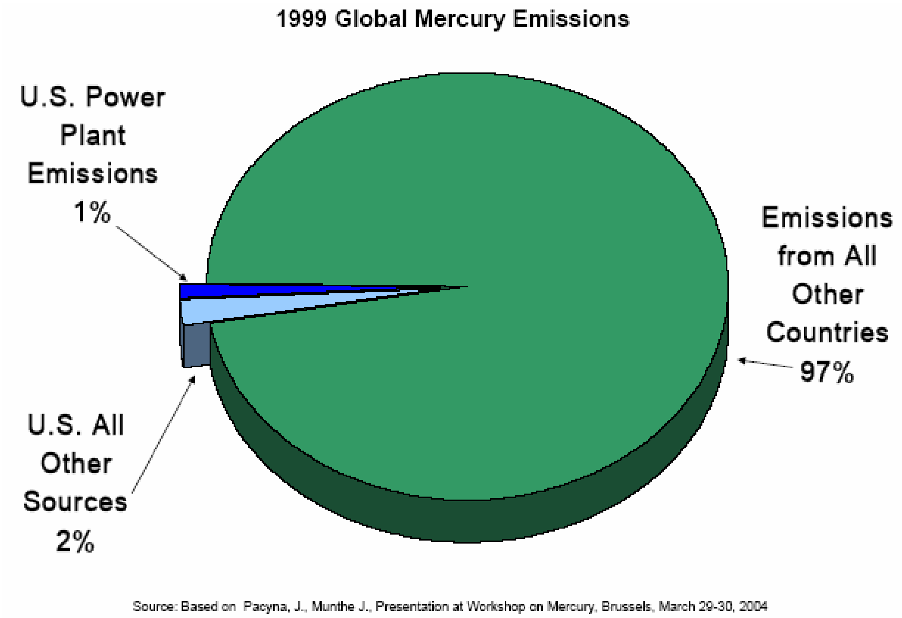


Source: EPA, 2006a

U.S. anthropogenic mercury emissions are estimated to account for roughly three percent of the global total, and emissions from the U.S. power sector are estimated to account for about one percent of total global emissions (UNEP, 2002) (refer to Figure 3-21). In recent years, with increasing awareness of mercury's toxicity, increasing regulation, and technological innovation and substitution, U.S. anthropogenic emissions of mercury have decreased. They have declined 45 percent since 1990 (EPA, 2006b) (refer to Figure 3-22). The two biggest declines were in emissions from medical waste incinerators and municipal waste combustors.

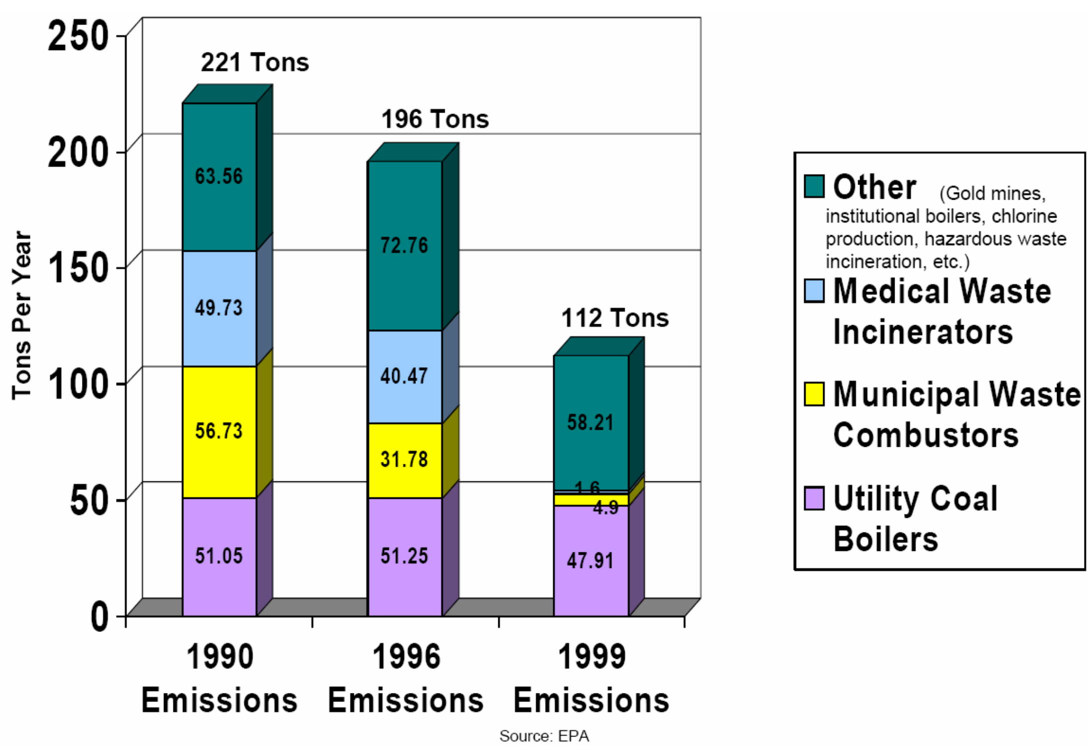
Mercury occurs naturally in coal at trace amounts, and unless controlled, is released to the atmosphere when coal is burned. It is estimated that 48 tons of mercury, or about one-third of the total amount of mercury released annually by human activities in the United States, are released into the atmosphere annually by coal-fired power plants (EPA, 2006b). Montana power plants currently emit approximately one-half ton (1,042 lbs) of mercury, or about one percent of total U.S. power plant emissions (DEQ, 2006b).

Figure 3-21. Pie Chart of U.S. and Utility Mercury Emissions Compared to Total Global Emissions



Source: EPA, 2006b

Figure 3-22. Declines in Anthropogenic U.S. Mercury Emissions Since 1990



Source: EPA, 2006b

Current estimates are that 80 percent or more of the mercury deposited within the United States was emitted from sources outside the U.S. and Canada (EPA, 2006b; see Figure 3-23).

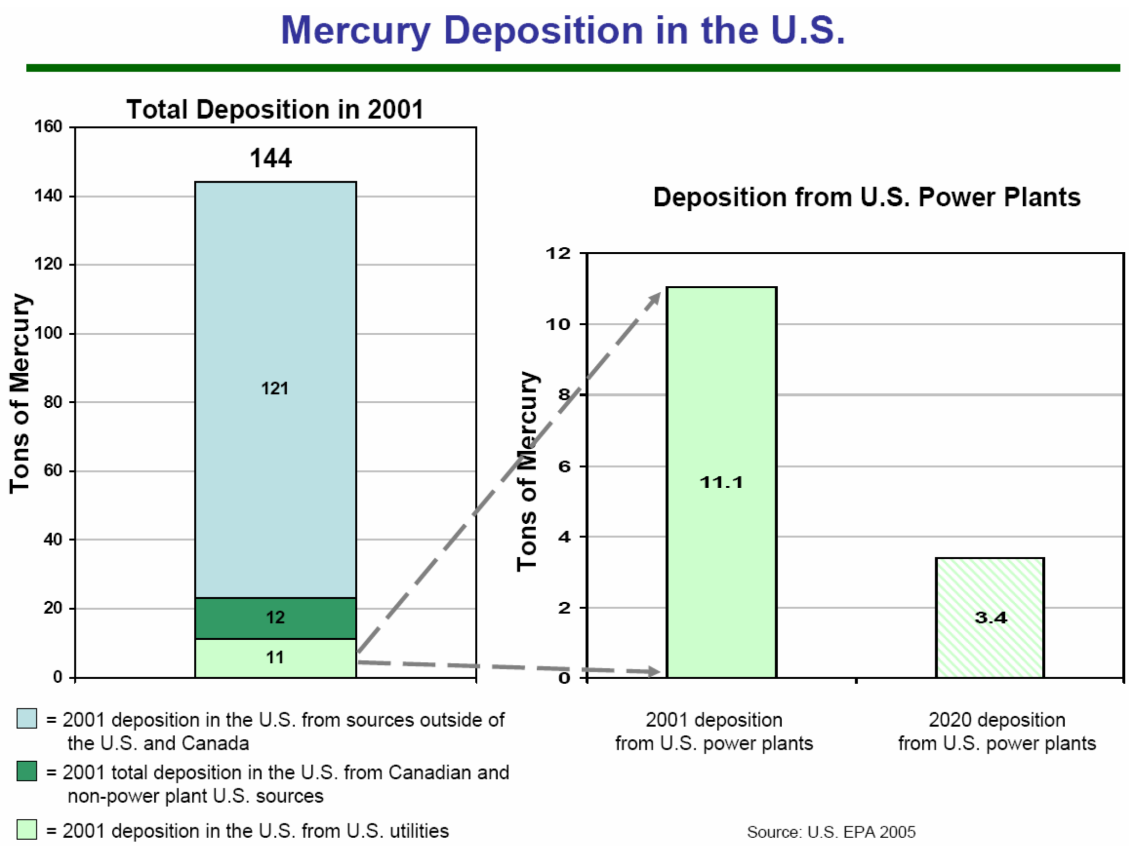


Figure 3-23. Mercury Deposition in the United States (2001) by Source
Source: EPA, 2006b

On March 15, 2005, EPA issued the Clean Air Mercury Rule (CAMR), which will permanently cap and reduce mercury emissions from coal-fired power plants (USEPA, 2005c). This rule will reduce mercury emissions in two phases. The first will reduce emissions using currently mandated technology by 2010 and the second will reduce emissions further by 2018. Additional and updated information related to mercury emissions from electric generating units is available at http://www.epa.gov/mercury/ . The CAMR relies on markets to reduce pollution, and allows companies to buy and sell allotted pollution limits.

The CAMR has served as the impetus for Montana and other states to develop their own rules concerning mercury emissions (AP, 2006). EPA assigned most states and two Indian tribes an emissions budget for mercury, and these states must submit a SIP revision detailing when they will meet their budget for reducing mercury from coal-fired power plants (USEPA, 2006d).

Montana had until November 16, 2006 to comply. On March 23, 2006, the Montana Board of Environmental Review authorized rule making to regulate mercury emissions at coal-fired power plants in the state. Montana's proposed rule, which provided for more stringent mercury emissions control requirements and deadlines than CAMR, was prepared by DEQ and reviewed

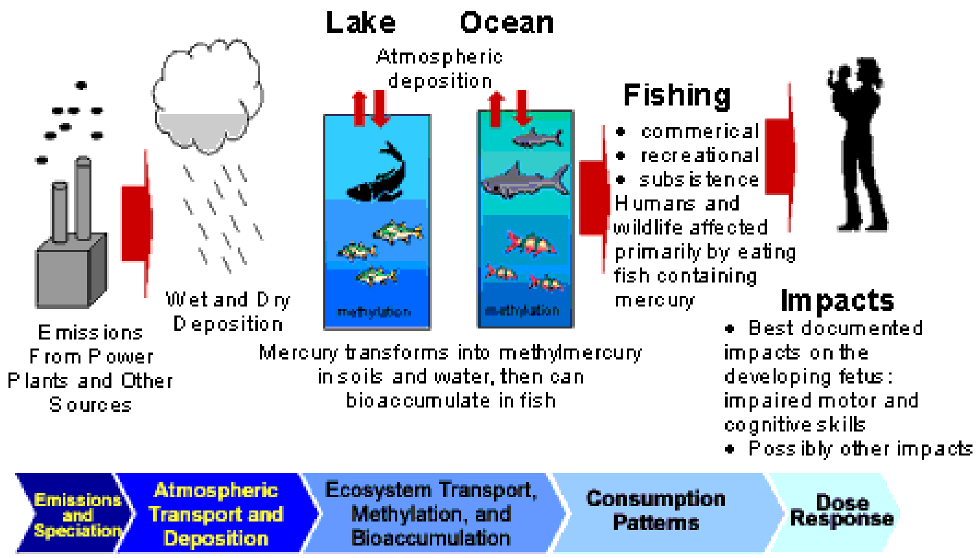
by the Board (DEQ, 2006c). Montana's mercury rule, which became effective on October 27, 2006, is at least as stringent, and in many aspects more stringent, than the CAMR.

While the overall trend in the global mercury burden since pre-industrial times appears to be increasing (by an estimated two to five times), there is some evidence that mercury concentrations in certain locations have been stable or decreasing over the past few decades. The downward trend in mercury concentrations observed in the environment in some geographic locations over the last few decades generally corresponds to declining regional mercury use and consumption patterns over the same time frame (USEPA, 1997c).

Transformation to Methylmercury and Exposure Pathways

Once in aquatic systems, mercury can exist in dissolved or particulate forms and can undergo a number of chemical transformations (Figure 3-24). Sediments contaminated with mercury at the bottom of surface waters can serve as an important reservoir of the element, with sediment-bound mercury recycling back into the aquatic ecosystem for decades or longer. Mercury also has a long retention time in soils, from which it may continue to be released to surface waters and other media for long periods of time, possibly hundreds of years (EPA, 1997a).

Figure 3-24. Mercury Exposure Pathways



Source: EPA, 2006e

Plants, animals and humans can be exposed to mercury by direct contact with contaminated environmental media or ingestion of mercury-contaminated water and food. Mercury that enters water bodies and sediments can ultimately be transformed through "methylation" (attachment of one carbon and three hydrogen atoms) into a more toxic form, methylmercury (CH_3Hg). Methylmercury can be formed in the environment both by microbial metabolism as well as by abiotic, chemical processes, although it is generally believed that microbial metabolism is the dominant process (UNEP, 2002).

Unlike other forms of mercury, methylmercury is readily absorbed across biological barriers and the gastrointestinal tract. Methylmercury can build up in tissues of organisms (bioaccumulation) and increase in concentration along the food chain (biomagnification) (EPA, 1997c).

Almost all human exposure to methymercury is through fish consumption (EPA, 1997d). Estimates developed by the World Health Organization and published by the U.S. Agency of Toxic Substances and Disease Registry (ATSDR) indicate that 99.6 percent of methylmercury intake in the general population arises from fish consumption (ATSDR, 1999).

The Long Term Hazards of Toxic Substances – Bioaccumulation and Biomagnification

Bioaccumulation: The process by which organisms, including humans, can take up toxins and contaminants more rapidly than their bodies can eliminate them. For example, the body burden of mercury can grow over time if an organism continually ingests this heavy metal, perhaps accumulating to toxic levels. If, on the other hand, an organism ceases to ingest mercury, the body burden will decline at a rate specific to each species. In human beings, about half the body burden of mercury can be eliminated within 70 days of ceasing to ingest it.

Biomagnification: The incremental increase in the concentration of toxins at each higher level in the food chain or food pyramid of an ecosystem. Biomagnification occurs because the food sources for species higher on the food chain are progressively more concentrated in persistent toxins like mercury.

As of the year 2000, some forty states (including Montana) had issued fish consumption advisories for methylmercury on certain water bodies while 13 states, including Montana (northern pike, lake trout, and walleye over 15 inches) had statewide advisories for some or all game fish from lakes and rivers. The Montana Sport Fish Consumption Guidelines provide recommendations on the amount and type of sport fish that can be safely eaten, how to prepare caught fish, and what special precautions should be taken by higher-risk individuals. By employing a margin of safety, the guidelines are intended to protect consumers from the most subtle effects of mercury toxicity. The guidelines are generally designed to protect higher-risk segments of the population, in particular, pregnant women, women of childbearing age, children, and anglers who regularly consume fish caught in Montana waters in larger quantities over long periods of time (MDPHHS and FWP, no date).

Montana fish consumption guidelines vary substantially by fish species and size, water body, and consumer (adult men or women and children). They apply to approximately 30 water bodies in the state, all but two of which are lakes and reservoirs. The Missouri River does not have a fish consumption guideline (MDPHHS, 2005).

Generally, mercury levels in Montana fish are relatively low. For example, the state's brook, rainbow and cutthroat trout, perch, and small panfish average less than 0.15 ppm of methyl-mercury. By way of comparison, commercially available canned tuna averages 0.17 to 0.20 ppm. However, certain species and size classes of fish in some locations do contain levels that warrant concern for those eating these fish on a frequent or prolonged basis (MDPHHS, 2005).

Health and Ecological Effects

The study of mercury's effects on health reflect the dose-response principle, which states that organisms respond to toxic substances according to the amount or dose of the substance that gets

into their bodies. This is one of the fundamental principles of the field of toxicology – with increasing dose or exposure to a substance, there are likely to be greater effects.

Mercury is a well-documented human toxin at sufficiently high doses. For example, clinically observable neurotoxicity has been observed following exposure to large amounts of inorganic mercury (e.g., "Mad Hatters Disease"). Consumption of highly contaminated foodstuffs (e.g., methylmercury contaminated fish or grain) has also induced acute neurotoxicity. The most subtle effects of mercury are believed to be associated with methylmercury exposure during pregnancy. Effects on individuals exposed in utero at comparatively low doses may include impaired cognitive test performance and deficits in sensory ability. These effects may progress to tremors, inability to walk, convulsions and death if exposure levels are extremely high (EPA, 1997e). High exposures to inorganic mercury may also result in permanent kidney damage (EPA, 2003).

Links between mercury exposure and autism have been suggested, but these possible links remain speculative rather than definitive. For example, a recent study in Texas reported a positive correlation between environmentally released mercury pollution and rates of special education and autism at the county level (Palmer et al., 2005). However, this study did not look specifically at mercury released from power plants and it is unclear what significance power plant emissions played in their reported association.

In addition to neurotoxicity from acute and chronic exposure in human beings, mercury poisoning can potentially cause adverse health effects on individual animals and plants, up to and including mortality, and therefore may potentially affect wildlife populations and ecological communities (EPA, 1997a). Severe neurological effects were already observed in animals at Minamata, Japan, prior to the recognition of human poisonings – birds experienced severe difficulty in flying and exhibited other grossly abnormal behavior (UNEP, 2002). However, these effects occurred at levels of fish contamination that were 10 to 20 times higher than the Food and Drug Administration (FDA) limit for human consumption of 1 ppm and roughly 100 times higher than the levels in Montana fish cited earlier in this section (FDA, 1994).

Adverse effects of elevated mercury levels in fish include death, reduced reproductive success, impaired growth and development, and behavioral abnormalities. Reproductive effects are the primary concern for mercury poisoning in wildlife and can occur at dietary concentrations well below those which cause overt toxicity. Effects of mercury on birds and mammals include death and sub-lethal effects such as reduced reproductive success, impaired growth and development, liver and kidney damage, and neurobehavioral effects (EPA, 1997a).

In sum, mercury is ubiquitous in the earth's biosphere, occurring in the air, water, land, and soil, as well as in living organisms. In the industrialized era, human activities have mobilized greater amounts of mercury, thereby exposing organisms, ecosystems, and human beings to increased levels of mercury, including increased levels of a particularly toxic form, methylmercury. Almost all human exposure to methylmecury is from ingesting contaminated fish. In low, periodic, or occasional doses, methylmercury can be voided by the body and is not generally problematic; at sustained, excessive doses, it may accumulate in certain tissues and organs to concentrations that can cause a variety of adverse health effects on humans and wildlife. These

negative effects may be acute or chronic, and from sub-lethal to lethal. While mercury contamination is widespread, indeed global, cases involving serious human health impacts have arisen from specific point source discharges to water or accidental food contamination rather than dispersed emissions to air.

3.3.6 GLOBAL CLIMATE CHANGE

In recent decades climatologists and other earth scientists have expressed growing concern that the earth's climate appears to be warming as a result of an accumulation of greenhouse gases (GHGs) in the atmosphere. The earth's surface temperature has risen by about one degree Fahrenheit over the last century, and the warming process has accelerated during the past two decades (Figure 3-25) (EPA, 2000c).

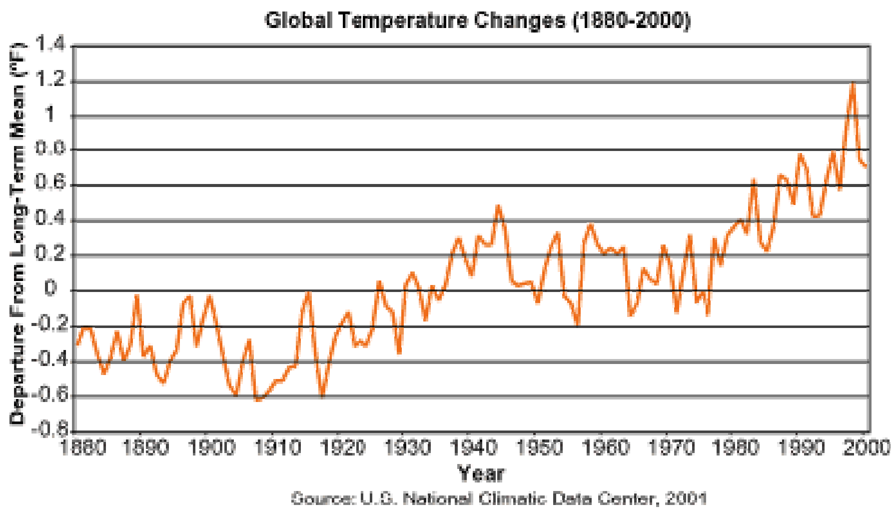


Figure 3-25. Average Global Temperature Trend from 1880 to 2000
Source: EPA, 2000c

Some GHGs occur naturally in the atmosphere, while others result from human activities (EPA, 2005h). Naturally occurring GHGs include water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Certain GHGs are being released in growing quantities by expanding human populations and economic activities, particularly the combustion of fossil fuels (oil, natural gas, and coal) and the clearing/burning of forests, all of which emit carbon dioxide, the principal greenhouse gas, adding to the levels of this naturally occurring gas. Another important greenhouse gas – methane – escapes to the atmosphere from cattle flatulence and rice paddies, as well as from natural gas pipeline leaks and decomposition in landfills; in other words, methane levels in the atmosphere are rising due to expanding food and energy production and waste generation. Still other greenhouse gases include nitrous oxide emitted during combustion and chlorofluorocarbons (or CFCs, which also attack the stratospheric ozone layer), now banned as a result of the Montreal Protocol and other international agreements (EPA, 2000c).

In 1997, DEQ inventoried GHG emissions in Montana for 1990, during which approximately 40 million tons of CO_2 equivalent were emitted in the state. Carbon dioxide was the major GHG emitted in Montana, comprising 74 percent of 1990 emissions. Methane was next, accounting

for approximately 14 percent of emissions, followed by halocarbons at 9.5 percent, and nitrous oxide at 2.5 percent.

Fossil fuel consumption was the major source of GHGs released in Montana, accounting for 71 percent of emissions. Petroleum comprised 53 percent of fossil fuel-related GHG emissions, coal 35 percent, and natural gas 12 percent. Emissions of halogenated fluorocarbons from Montana aluminum production made up 11 percent of total state emissions in 1990, while methane emissions from livestock were responsible for 10 percent. Overall, energy-related emissions accounted for 72 percent of GHGs, industrial production and agriculture each accounted for approximately 12.5 percent, and waste-related facilities accounted for three percent (DEQ, 1997). In 1999, funded by a grant from EPA, DEQ prepared a draft "Foundation for an Action Plan" to control GHGs emissions in the state; among other emissions sectors it considered, this document investigated strategies to reduce or offset utility industry GHG emissions (DEQ, 1999).

Energy from the sun heats the earth's surface and drives the earth's weather and climate; in turn, the earth radiates energy back out to space (Figure 3-26). GHGs are transparent to incoming solar radiation but trap some of the outgoing infrared (heat) energy, retaining heat rather like the glass panels of a greenhouse. Without this natural "greenhouse effect," temperatures would be much lower than they are now, and life as we know it would not be possible. Because of greenhouse gases, the earth's average temperature is a more hospitable 60 degrees Fahrenheit (EPA, 2000c).

Since the beginning of the Industrial Revolution, atmospheric concentrations of carbon dioxide have increased nearly 30 percent, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15 percent. These increases have enhanced the heat-trapping capability of the earth's atmosphere. Sulfate aerosols, common air pollutants, cool the atmosphere by reflecting light back into space; however, sulfates are short-lived in the atmosphere and vary regionally (EPA, 2000c). Also, with national and worldwide efforts to curb emissions of these pollutants, their offsetting influence is believed to be diminishing.

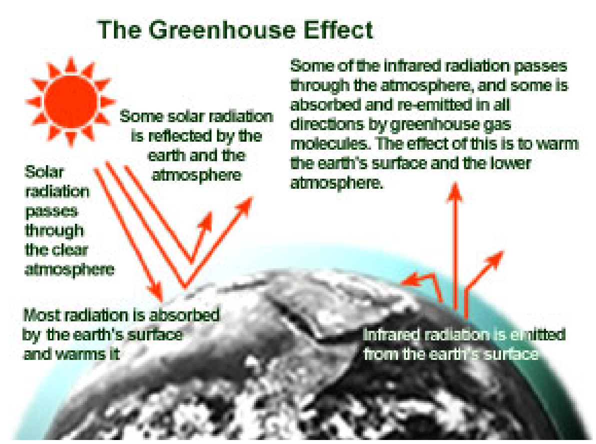


Figure 3-26. The Greenhouse Effect

Source: EPA, 2000c

The National Research Council of the National Academy of Sciences concluded in 2001 that the "warming process has intensified in the past 20 years, accompanied by retreating glaciers, thinning arctic ice, rising sea levels, lengthening of the growing season in many areas, and earlier arrival of migratory birds" (NRC, 2001). Among the predicted changes in the United States are "potentially severe droughts, increased risk of flood, mass migrations of species, substantial shifts in agriculture and widespread erosion of coastal zones" (NAST, 2000). While U.S. agricultural production could increase, due to "fertilization" of the air with carbon dioxide,

"many long-suffering ecosystems, such as alpine meadows, coral reefs, coastal wetlands and Alaskan permafrost, will likely deteriorate further. Some may disappear altogether" (Suplee, 2000; Anon., 2000).

In 2001, the Intergovernmental Panel on Climate Change (IPCC) released *Climate Change 2001: Impacts, Adaptation and Vulnerability*, a report prepared by Working Group II (which included approximately 50 lead authors from more than 20 countries). The report concludes:

> *The stakes associated with projected changes in climate are high* [emphasis in original]. Numerous Earth systems that sustain human societies are sensitive to climate and will be impacted by changes in climate…Impacts can be expected in ocean circulation; sea level; the water cycle; carbon and nutrient cycles; air quality; the productivity and structure of natural ecosystems; the productivity of agricultural, grazing, and timber lands; and the geographic distribution, behavior, abundance, and survival of plant and animal species, including vectors and hosts of human disease. Changes in these systems in response to climate change, as well as direct effects of climate change on humans, would affect human welfare, positively and negatively. Human welfare would be impacted through changes in supplies of and demands for water, food, energy, and other tangible goods that are derived from these systems; changes in opportunities for nonconsumptive uses of the environment for recreation and tourism; changes in non-use values of the environment such as cultural and preservation values; changes in incomes; changes in loss of property and lives from extreme climate phenomena; and changes in human health (IPCC, 2001).

While climate change is the ultimate global issue – with every human being and every region on earth both contributing to the problem and being impacted by it to one degree or another – it does manifest itself in particular ways in specific locales like Montana. During the past century, the average temperature in Helena increased 1.3°F and precipitation has decreased by up to 20 percent in many parts of the state (EPA, 1997h).

Over the next century, Montana's climate may change even more. In this region and state, concerns have been expressed by scientists and conservationists over a range of potential impacts, including:

- glaciers melting and disappearing in Glacier National Park and elsewhere in the Rocky Mountains (ABC News, 2006; NWF, 2005);
- a potential decline in the northern Rockies snowpack and stressed water supplies both for human use and coldwater fish (USGS, 2004; ENS, 2006; NWF, 2005; Farling, no date);
- survival of ski areas receiving more rain and less snow (Gilmore, 2006), drying of prairie potholes in eastern Montana and a concomitant decline in duck production (NWF, 2005);
- an increase in the frequency and intensity of wildfires as forest habitats dry out, and perhaps a conversion of existing forests to shrub and grasslands (NRMSC, 2002; NWF, 2005; Devlin, 2004);
- loss of wildlife habitat (USGS, 2004; NWF, 2005);
- possible effects on human health from extreme heat waves and expanding diseases like Western equine encephalitis, West Nile virus, and malaria (EPA, 1997h; RP, 2005);
- possible impacts on the availability of water for irrigated and dryland crop production alike (EPA, 1997h; RP, 2005)

3.4 BIOLOGICAL RESOURCES

3.4.1 INTRODUCTION

The biological resources analysis has been prepared and submitted as a part of the environmental review process described in the NEPA, MEPA, and the Endangered Species Act (ESA). The purpose of this report is to characterize the general biological resources, rare and sensitive species, threatened and endangered species, and wetlands in the vicinity of the project area. The analysis includes an assessment of the potential impacts to these biological resources (Section 4.6) for each alternative as a result of the proposed project.

General descriptions for the project area are from McNab and Avers (1994) for Section 331D, the northwestern glaciated plains. This section includes level to gently rolling continental glacial till plains and rolling hills on the Missouri Plateau. Steep slopes border some of the larger rivers. Elevation ranges from 2,500 to 5,000 ft (763 to 1,525 m). This section is within the Great Plains physiographic province. Glacial till is underlain by soft Cretaceous marine shale. These soils are generally deep and range in texture from loamy to clayey.

Annual precipitation averages 10 to 15 inches (250 to 380 mm), with maximums occurring in spring and early summer. Winters are extremely cold with desiccating winds and snow. Climate is cold continental, with dry winters and warm summers. Temperature averages 37 to 45^{o} F (3 to 7^{o} C), and the growing season lasts 100 to 130 days. There are high densities of dendritic drainage patterns on areas of exposed marine shales. Low to medium density drainage patterns occur on the better drained glacial till. The higher order streams show subtle structural and glacial influence. Major rivers include the Missouri, Milk, and Poplar. Fire and drought are the principal sources of natural disturbance, and most of the area is in cropland or is grazed by livestock.

The area surrounding Great Falls is characterized by large tracts of grasslands that have been heavily cultivated for decades, with clusters of urban, suburban, industrial and rural development. The climate is semi-arid and the few rivers and tributaries present drain into the Missouri River. Topography is mostly flat or gently rolling hills and buttes, with incised canyon drainages created by creeks, rivers, and wind erosion. Shrubs and trees are mostly confined to these small canyon habitats or cultivated near structures. Development at either site for the boilers, turbine-generator, pollution control equipment, solid waste storage facilities, and associated infrastructure would affect about 320 acres (130 ha).

The Salem plant site is cultivated for small grains, and is mostly agricultural fields. A few home sites with outbuildings are located in the area, and dirt access roads mostly follow Section lines. This site was surveyed in detail and is discussed below.

Because the Industrial Park site is currently considered an alternative to the Salem site, specific locations and lengths of connections for raw water, potable water, wastewater, and power transmission lines have not been formally identified. The Industrial Park site has been cultivated in the past, but is currently vegetated with a mixture of grasses including smooth brome (*Bromus*

inermis), crested wheatgrass (*Agropyron spicatum*), thickspike wheatgrass (*A. dasytachyum*), and Kentucky bluegrass (*Poa pratensis*), and a variety of weedy forbs. Past developments have disturbed the area, and buildings, storage sheds, and roads are common. Wildlife species recorded at the site included western meadowlark (*Sturnella neglecta*), unidentified vole (likely *Microtus pennsylvanicus*), Richardson's ground squirrel (*Spermophilus richardsonii*), and badger (*Taxidea taxus*). If this site is selected, the electrical interconnections, potable water and wastewater would likely be shorter than for the Salem site due to closer proximity to established infrastructure; the raw water line from the Morony Reservoir would be longer, however.

The project is divided into infrastructure components, and survey results and potential project impacts are discussed for each segment. Wildlife data for the potential project area and each segment are organized for brevity and clarity. The existing Montana Natural Heritage Program (MNHP) database query results, wildlife sightings during project area surveys, fish species in Morony Reservoir, and noxious weeds are in table format, and other general wildlife and vegetation are included in descriptive text sections.

3.4.2 PRE-FIELD RESEARCH

Biologists conducted pre-field research for previously recorded wildlife sighting records within a 10-mile (16-km) radius of the proposed Salem plant site, and the alternate GFIP location (WESTECH, 2005). Sighting data were also collected for the 28.4 miles (46 km) of transmission lines connecting the proposed plant sites to main conductor lines. Pre-field research consisted of contact with landowners, evaluation of aerial photographs, query of the MNHP database for past sightings within a 10-mile (16-km) radius of HGS (Table 3-9), and interviews of state and federal resource specialists at Montana Fish, Wildlife, and Parks (FWP) and the U.S. Fish and Wildlife Service (USFWS) (WESTECH 2005).

Wildlife habitats in the vicinity of proposed sites for the HGS were identified using designations by WESTECH (1993). This typing method is based on Coenenberg et al. (1977) and has been used in numerous wildlife studies in Montana and other states, and has been accepted for use in NEPA documents. Habitat type and subtype codes are based on existing, rather than climax, vegetation and/or other features such as rock outcrops and ponds.

Lists of fish, amphibians, reptiles, mammals and birds that could potentially occur in the region encompassing the HGS were developed from published and unpublished literature sources, including Montana Bird Distribution Committee (MBDC, 1996), Foresman (2001), Holton and Johnson (2003), Maxell et al. (2003), Werner et al. (2004), and FWP (2005). Water quality status of affected water bodies was obtained from the 2004 DEQ integrated report (DEQ 2004d). During the field reconnaissance all fish and wildlife species were recorded by the habitat in which they or their evidence occurred. Suitable habitat was defined as any useable habitat for fish; breeding habit for amphibians; foraging, security and denning habitats for reptiles and mammals; and preferred breeding/nesting habitat for birds. Consequently some migrant birds may occur seasonally and may have been recorded in the study area even though "suitable habitat" is not present (WESTECH, 2005).

Table 3-9. Montana Species of Concern Recorded Within 10 miles of Great Falls, MT

Species		Suitable Habitat[b]
Common Name	**Scientific Name**	
Plants		
Roundleaf water hyssop	*Bacopa rotundifolia*	Muddy shores of ponds and streams; last recorded in 1891
Many-headed sedge	*Carex sychnocephala*	Moist meadows; lake shores; thickets at low elevations; last recorded in 1890
Chaffweed	*Centunculus minimus*	Drying vernal pools (seasonal wetlands); last recorded in 1891
	Entosthodon rubiginosus	Moss; last recorded in 1887
	Funaria americana	Moss; last recorded in 1902
Guadalupe water-nymph	*Najas guadalupensis*	Submerged in shallow fresh water of oxbow sloughs and ponds; drying vernal pools; last recorded in 1891
Dwarf woolly heads	*Psilocarphus brevissimus*	Drying vernal pools; last recorded in 1891
California waterwort	*Elatine californica*	Shallow waters and mudflats along the edges of wetlands; last recorded in 1891
Fish		
Blue sucker	*Cycleptus elongatus*	Missouri River below Morony Dam
Amphibians- none		
Reptiles		
Spiny softshell	*Apalone spinifera*	Missouri River below Morony Dam
Mammals - none		
Birds		
Ferruginous hawk	*Buteo regalis*	Sagebrush steppe, grasslands with rolling to steep slopes
Bald eagle	*Haliaeetus leucocephalus*	Larger rivers, lakes and reservoirs
Burrowing owl	*Athene cunicularia*	Grasslands with rodent and badger burrows
White-faced ibis	*Plegadis chihi*	Wetlands
Black-crowned night heron	*Nycticorax nycticorax*	Wetlands
Franklin's gull	*Larus pipixcan*	Wetlands
Common tern	*Sterna hirundo*	Wetlands
Black tern	*Chlidonias niger*	Wetlands

a *Source:* MNHP (2005b) and USFWS letter dated May 12, 2005.
b Suitable habitat for animals is defined in Section 3.2.4.1.

3.4.3 Field Inventory

The reconnaissance field dates were selected in response to project timing, regulatory schedule/procedures, and landowner availability. They were not selected as a function of

reproductive season for threatened and endangered species (TES) or species of concern. Field reconnaissance was conducted on April 18-19, and July 6, 2005 by driving all accessible public roads (some were impassable due to rain/mud) in the project vicinity. These roads provided vantage points for the GFIP and Salem sites, transmission line corridors, several sections of the Missouri River that may be crossed by transmission lines, Morony Dam and Reservoir, the fresh (potable) and waste water pipeline corridor, the raw water pipeline route including the area of the pump house on the Missouri River bank, and the proposed railroad route (WESTECH 2005). Species observed during the field surveys are shown in Table 3-10.

The proposed project covers a large area, and therefore different methods were used to assess habitat during surveys. Habitat that was accessible and surveyed on the ground comprised 34 percent of total area; not accessible but visible from vantage points was 38 percent; and not accessible nor visible from vantage points, therefore not surveyed comprised 28 percent (WESTECH, 2006a).

Proposed Railroad Spur

The proposed railroad spur running south from the Salem plant site would cross lands that are almost entirely cultivated for small grains, except for small strips of grass (primarily smooth brome and Kentucky bluegrass) associated with gravel barrow pits and field edges. No vegetated drainages are crossed by the route (WESTECH, 2005).

Two alternatives to the proposed rail spur alignment were considered. One would follow the abandoned railroad grade to Great Falls, the same corridor proposed for the fresh and waste water pipelines discussed below. The other would place the rail spur in the incised drainage habitat on the south side of the Missouri River, spanning Box Elder Creek and deeper drainages (WESTECH, 2005).

Figure 3-27. Transmission Line Crossing of Incised Drainage

Transmission Line 1

The proposed electrical transmission line from the Salem plant to the Great Falls substation north of the Missouri River would cross cultivated grain fields, several gentle-to-moderately steep incised drainages (Figure 3-27), Box Elder Creek, and the Missouri River including its associated upland habitats and rolling grasslands. The actual amount of each habitat disturbed by construction of the transmission line would depend on the final route location, spacing and location of structures, etc. The transmission line would span the Missouri River; there are 5-6 other transmission lines, including Northwest Energy's 230kV Broadview-to-Great Falls transmission line, already spanning the

Table 3-10. Wildlife Species Observed During Project Area Surveys

Site Observed	Common Name	Scientific Name
Railroad spur	Gray partridge	*Perdix perdix*
	Mourning dove	*Zenaida macroura*
	Common nighthawk	*Chordeiles minor*
	Horned lark	*Eremophila alpestris*
	European starling	*Sturnus vulgaris*
	Vesper sparrow	*Pooecetes gramineus*
	Western meadowlark	*Sternella neglecta*
	White-tailed jackrabbit	*Lepus townsendii*
	Northern pocket gopher	*Thomomys talpoides*
	Richardson's ground squirrel	*Spermophilus richardsonii*
	Red fox	(*Vulpes vulpes*)
Transmission line 1	Loons	Gaviiformes
	Grebes	Podicipediformes
	Pelican	Pelecaniformes
	Herons	Ciconiiformes
	Geese	Anseriformes
	Cranes	Gruiformes
	Plovers	Charadriiformes
Transmission line 1, Box Elder Creek, several upland sites	Killdeer	*Charadrius vociferous*
Transmission line 1, grasslands	Longbilled curlew	*Numenius americanus*
Box Elder Creek	Common snipe	*Gallinago gallinago*
Missouri River, fallow grain fields	Franklin's gull	*Larus pipixcan*
Box Elder Creek or along river	Beaver	*Castor canadensis*
	Muskrat	*Ondatra zibethicus*
	Raccoon	*Procyon lotor*
Fresh and Waste Water Pipeline Corridor	Horned lark	*Eremophila alpestris*
	American robin	*Turdus migratorius*
	European starling	*Sturnus vulgaris*
	Clay-colored sparrow	*Spizella pallida*
	Vesper sparrow	*Pooecetes gramineus*
	Savannah sparrow	*Passerculus sandwichensis*
	Western meadowlark	*Sternella neglecta*
	Northern pocket gopher	*Thomomys talpoides*
	Richardson's ground squirrel	*Spermophilus richardsonii*
Raw Water Pipeline	Common carp	*Cyprinus carpio*
	Unidentified sucker	*Catostomidae*
	Unidentified minnows	*Cyprinidae*
Wetlands	No species observed	N/A

Missouri River between Rainbow Dam and Morony Dam. Box Elder Creek would also be spanned (WESTECH, 2005).

The upland habitats provided by incised coulees, the Missouri River uplands, and the rolling grasslands near the substation provide year-round range for mule deer (*Odocoileus hemionus*), the only big game species recorded during the reconnaissance; most raptors (i.e., birds of prey including eagles, hawks, falcons and owls) would nest in these habitats as well (WESTECH, 2005). No active nests were found during the reconnaissance, but surface access limitations precluded searches of large portions of these habitats.

Shrubs, including rose (*Rosa* spp.), skunkbush sumac (*Rhus trilobata*), western snowberry (*Symphoricarpos occidentalis*), junipers (*Juniperus* spp.), chokecherry (*Prunus virginiana*) and currants (*Ribes* spp.) were an important component of the incised drainages and uplands associated with the Missouri River (WESTECH, 2005). Shrub stands provide habitat for species such as ring-necked pheasant (*Phasianus colchicus*), yellow warbler (*Dendroica petechia*), common yellowthroat (*Geothlypis trichas*) and spotted towhee (*Pipilo maculates*), as well as browse for mule deer.

Some trees are found in the drainage and Missouri River uplands habitats, primarily Rocky Mountain juniper (*Juniperus scopulorum*) with occasional Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*) and Russian olive (*Eleagnus angustifolia*). Scattered willows (*Salix* spp.) and cottonwood (*Populus* spp.) were present along the moist river and creek banks. Trees and taller shrubs provided nesting substrate for several species of birds observed during the reconnaissance, and provided potential nest sites for raptors (WESTECH, 2005).

Box Elder Creek and the Missouri River provided the only perennial stream habitat observed during the survey. Box Elder Creek, in the vicinity of the transmission line crossing, could not be accessed but appeared to be a small (3-5 feet or 1-1.5 m wide), shallow perennial stream. According to the Montana Fisheries Information System (MFISH) information for Box Elder Creek (FWP 2005), it is managed as trout water, although brook trout in this reach of the stream are considered rare. Fathead minnows (*Pimephales promelas*) and longnose dace (*Rhinichthys cataractae*) are considered common (FWP, 2005; WESTECH, 2005).

Transmission Line 1 would cross the Missouri River downstream from Cochrane Dam, above the pool formed by Ryan Dam. The river in this reach has steep banks with little or no emergent vegetation. According to MFISH information (FWP, 2005), this reach of the Missouri River is managed as non-trout water. Although there is good species diversity in this reach of the river, most game species are rare (FWP, 2005; WESTECH, 2005).

Transmission Line 2 and Switchyard

Depending on final design, the transmission line that would run west/southwest from the Salem plant site to the proposed switchyard on the existing NWE 230kV transmission line would be placed in cultivated fields and would span Box Elder Creek parallel to Transmission Line 1 (discussed above) (WESTECH, 2005).

Fresh and Waste Water Pipeline Corridor

Depending on final design, the fresh and waste water pipelines that would run south/southwest from the Salem plant site to Great Falls would be buried in cultivated fields alongside a gravel county road and an abandoned railroad grade, and would also cross Box Elder Creek (discussed above) on the existing railroad grade (WESTECH, 2005).

Raw Water Pipeline

The raw water pipeline can be described in two distinct segments: 1) the portion from the Salem plant site to the directional drill site on the top of the hill above the Missouri River; and 2) the portion that will be directionally drilled from the hilltop to the collector well at the river (Figure 3-28).

Figure 3-28. Proposed Raw Water Intake Route

Segment 1 would be buried in existing grain fields. Segment 2 would be directionally drilled from hilltop to the collector well.

Figure 3-29. Morony Reservoir at Site of Proposed Intake

The intake structure for the raw water pipeline would be placed in the Missouri River pool above Morony Dam (Figure 3-29). The river bank at this location is grassland with a few scattered non-native Russian olive trees. The river bed visible from the bank appeared to be cobble and gravel with considerable sediment (WESTECH, 2005).

Several species of fish are known to be present in Morony Reservoir (Gardner, 2005; PPL Montana, 2006). The utility PPL Montana has conducted long-term sampling of fishes in several reservoirs, including Morony, summarized in Table 3-8 (PPL Montana, 2006). These data cover gillnetting results from 10 years sampled between 1992 and 2005. The data include total fish caught by species and catch per unit hour, which divides numbers of fish by net hours to estimate fish caught by level of effort. Gillnetting tends to under-represent small fish, such as fingerlings and minnows, and thus does not provide a complete inventory of species. However, the results show a reasonable diversity of fish in the reservoir with white sucker most abundant; walleye

Table 3-11. Fish Species in Morony Reservoir; Gillnet Sampling 1992 to 2005 Catch per Unit Effort (CPUE)[1]

Year	Total Net Hours	Rainbow trout		Brown trout		Walleye		White sucker		Longnose sucker		Yellow perch	
		#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE
1992	127	0	0.00	1	0.01	25	0.20	183	1.44	1	0.01	5	0.04
1995	102	1	0.01	2	0.02	2	0.02	153	1.50	3	0.03	7	0.07
1997	119	0	0.00	1	0.01	5	0.04	275	2.30	0	0.00	1	0.01
1998	80	0	0.00	0	0.00	2	0.03	180	2.25	0	0.00	9	0.11
1999	130	3	0.02	0	0.00	9	0.07	154	1.18	0	0.00	24	0.18
2000	120	1	0.01	0	0.00	14	0.12	152	1.27	0	0.00	9	0.08
2001	110	1	0.01	0	0.00	11	0.10	104	0.94	0	0.00	25	0.23
2002	103	1	0.01	0	0.00	10	0.10	81	0.78	0	0.00	2	0.02
2003	101	2	0.02	0	0.00	7	0.07	110	1.09	0	4.00	0	0
2005	119	1	0.01	0	0.00	11	0.09	42	0.35	0	0.00	4	0.03
Totals		**10**	**0.088**	**4**	**0.036**	**96**	**0.828**	**1434**	**13.11**	**4**	**4.037**	**86**	**0.77**

[1]Source: PPL Montana 2006.

Table 3-11 (cont.). Fish Species in Morony Reservoir; Gillnet Sampling 1992 to 2005 Catch per Unit Effort (CPUE)[1]

	Carp		Mountain whitefish		Flathead chub		Black bullhead		Sauger		Total Fish
	#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE	
1992	0	0	0	0		0	0	0	0	0	**215**
1995	1	0.01	0	0	1	0.01	7	0.1	0	0	**176**
1997	3	0.03	0	0	0	0	1	0	0	0	**286**
1998	0	0	0	0	0	0	0	0	0	0	**191**
1999	0	0	0	0	0	0	0	0	0	0	**187**
2000	0	0	0	0	0	0	4	0	2	0	**181**
2001	0	0	0	0	0	0	0	0	0	0	**140**
2002	1	0.01	0	0	0	0	0	0	0	0	**94**
2003	0	0	0	0	0	0	0	0	2	0	**119**
2005	0	0	0	0	0	0	1	0	2	0	**60**
Totals	**5**	**0.04**	**0**	**0**	**1**	**0.01**	**13**	**0.1**	**6**	**0.1**	**1649**

[1]Source: PPL Montana 2006.

and yellow perch fairly abundant; and rainbow trout, brown trout, longnose sucker, black bullhead, carp, sauger and flathead chub in low numbers. FWP and PPL Montana are using Morony Reservoir to rear sauger (*Sander canadensis*), a Montana species of concern, for reintroduction into riverine habitats (Gardner, 2005; WESTECH, 2006c).

Water Quality

The reach of the Missouri River from Rainbow Dam to Morony Dam is listed as impaired on Montana's 2000 303(d) list. This list classifies water bodies based on the level of pollutants that reduce water quality, and impair designated uses (DEQ, 2004d). Waters on the 303(d) list must have Total Maximum Daily Loads (TMDLs) developed to return the waters to full support of all designated uses. The river reach adjacent to the proposed site is listed as impaired due to excess metals, siltation, fish habitat degradation, suspended solids, turbidity, and other habitat alterations (DEQ, 2004d).

Wetlands

Wetlands delineations satisfying Section 404 of the Clean Water Act were not conducted in the HGS project areas during field survey (WESTECH, 2005). However, field work and review of aerial photographs of the entire area suggested that jurisdictional wetlands are generally limited to narrow fringes of perennial streams such as Box Elder Creek and the Missouri River. There appeared to be few if any permanent, seasonal or temporary wetlands in upland habitats that would be affected by the various aspects of the project (WESTECH, 2005). Five small, isolated wetlands (designated as "freshwater emergent wetland" and "other") are shown within the proposed Salem site on the USFWS National Wetlands Inventory (USFWS, 2006). These wetlands are not jurisdictional under current federal agency interpretation of Section 404.

Another isolated wetland appears to be near the proposed water pipeline route; this wetland can be easily avoided. The upper ends of several incised drainages visited during the survey did not show defined channel (bed and bank) characteristics, but a channel (often intermittent) was present farther down the drainage. However, drainages with water flow for more than 95 days out of the year are considered state waters, and most drainages classified as "intermittent" on USGS topographic maps meet this criteria.

3.4.4 FEDERALLY LISTED ENDANGERED OR THREATENED, AND STATE LISTED SPECIES OF CONCERN

Endangered or Threatened Species

The USFWS identified two federally listed species that could occur in the project region, bald eagle (threatened) and Canada lynx (threatened) (WESTECH, 2005).

Bald eagle

There is a bald eagle nest near the confluence of Belt Creek and the Missouri River, approximately one mile (1.6 km) downstream from Morony Dam (Dubois, 2005; WESTECH, 2005). The site is about two miles (3.2 km) from both the Salem plant site and the proposed raw

water pipeline intake on the Missouri River above Morony Dam, and is not visible from either site. The nest was inactive in 2004 (Dubois, 2004; WESTECH, 2005) but was active in 2005 and produced one fledgling (Taylor, 2005; WESTECH, 2005). There are no other known bald eagle nests or territories upstream from Belt Creek to the City of Great Falls (Taylor, 2005; WESTECH, 2005).

Figure 3-30. Bald Eagle

Canada lynx
Eastward range extensions of lynx into Montana, Idaho and Washington follow boreal forests at higher elevations (Foresman, 2001). Lynx distribution and abundance is closely associated with those of their primary prey species, the snowshoe hare (*Lepus americanus*), found in young, dense lodgepole pine stands. Lynx den in areas of dense canopy closure with a high density of downed trees, located near stands that provide suitable foraging habitat. Both stand types must be adjacent to each other to provide suitable lynx habitat, or suitable travel corridors must exist between them (Foresman, 2001). The project area does not support suitable Canada lynx habitat, and lynx have not been reported within 10 miles (16 km) of the project vicinity (MNHP, 2005a; WESTECH, 2005).

Animal Species of Concern

One fish, one reptile and eight bird species that are considered to be of special concern in Montana (that is, at risk or potentially at risk of declining or disappearing in the state) have been recorded within 10 miles (16 km) of the HGS project (Table 3-6; MNHP, 2005a). Additional species may occur but have not been documented by MNHP (WESTECH, 2005).

Aquatic species
The blue sucker (*Cycleptus elongatus*) and spiny softshell turtle (*Trionyx spiniferus*) are known to occur along the Missouri River below Morony Dam (WESTECH, 2006d), downstream of the proposed project site. Both species prefer large prairie rivers and streams. Construction of dams on these rivers is credited with restricting the distribution of both species (MNHP, 2005b). FWP is rearing sauger in Morony Reservoir, the body of water which includes the proposed raw water intake site (WESTECH, 2006c). Sauger is a state species of concern, and the fish in this Morony Reservoir population will be used in reestablishment programs in other Montana waters (Gardner, 2005; WESTECH, 2006c).

Avian species
In Montana, ferruginous hawks (*Buteo regalis*) prefer to nest in prairie shrub habitats, often with steep slopes, with an abundance of small mammals (rodents to jackrabbits) for prey; they generally avoid nesting in areas converted to agriculture (MNHP, 2005b). The incised drainage habitat and uplands associated with the Missouri River could be considered nesting habitat for the ferruginous hawk, along with several other species such as prairie falcon (*Falco mexicanus*), Swainson's hawk (*B. swainsoni*), and red-tailed hawk (*B. jamaicensis*) (Taylor, 2005). There are

no known nests in the project vicinity; the nearest reported nest is about 10 miles (16 km) to the northwest (MNHP, 2005a; WESTECH, 2005). Ferruginous hawks, along with many other species of raptors, would be expected to be present in the HGS project vicinity during migration.

Similarly, the burrowing owl (*Athene cunicularia*) is a ground-dwelling bird associated with burrows of ground squirrel (*Spermophilus* spp.), prairie dogs (*Cynomys* spp.) and badgers in prairie grasslands (MNHP, 2005a). Therefore the species could occur in the incised drainage and grassland habitat of the HGS project vicinity, although no nests are known from the area (WESTECH, 2005).

The white-faced ibis (*Plegadis chihi*), black-crowned night heron (*Nycticorax nycticorax*), Franklin's gull (*Larus pipixcan*), common tern (*Sterna hirundo*) and black tern (*Chilidonias niger)* are generally associated with wetlands and large rivers. All five species could occur along the Missouri River in the HGS project vicinity during migration, but none would be expected to nest there (MNHP, 2005b). Franklin's gulls were observed in agricultural fields during the survey in April 2005. All nesting records of these species are from Benton Lake National Wildlife Refuge, about 7-12 miles (11-19 km) from the HGS project (WESTECH, 2005).

Mammalian Species of Interest

Mule deer (*Odocoileus hemionus*) are the most common big game animal in the project vicinity (Figure 3-31). They are non-migratory, year-round residents of the area, primarily using the "breaks" habitats (also referred to as "incised drainages" and "Missouri River associated uplands") but also feeding in adjacent grain fields and Conservation Reserve Program (CRP) fields. The Salem plant site is on the west edge of a 70 square-mile (181 sq.-km) "mule deer census area", which is surveyed four times per year (one aerial survey after hunting season and three more in spring). In recent years with mild winters FWP typically counts about 500 mule deer in this area, which extrapolates to approximately seven deer per square mile (18/sq. km). Similar densities would be expected in the Highwood Generating Station project area (WESTECH, 2006e).

Figure 3-31. Mule Deer

There are a few white-tailed deer (*Odocoileus virginianus*) along Belt Creek and Rogers Coulee (the first drainage east of the Salem plant site), and they could be expected in low numbers in most drainages with riparian habitat. FWP typically counted about 50 white-tailed deer in the adjacent mule deer census area, indicating that they are much less common than mule deer, or about 0.7 deer/mi^2, or just one-tenth the density of mule deer (WESTECH 2006e).

The area affected by the HGS is not particularly good pronghorn (*Antilocapra americana*) habitat, primarily because the native vegetation on level-to-gently rolling areas has been

converted to agriculture. In the mule deer census area east of the Salem site, FWP typically counted about 100 pronghorn, or about 1.4/mi^2 (WESTECH 2006e).

Other game/furbearer species in the area are sharp-tailed grouse (*Tympanuchus phasianellus*), gray partridge (*Perdix perdix*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), mountain lion (*Puma concolor*), and bobcat (*Lynx rufus*) (WESTECH 2006e).

Plant Species of Concern

Within 10 miles (16 km) of the HGS there are records of eight species of plants considered species of concern in Montana from (Table 3-6; MNHP, 2005d; WESTECH, 2005).

Two species of moss (*Entosthodon rubiginosus* and *Funaria americana*) were recorded along the Missouri River upstream of the current Cochrane Dam in the late 1880s and early 1900s (WESTECH, 2005).

Noxious Weeds

Table 3-12 includes the species found in the proposed project area:

Table 3-12. Noxious Weeds Observed During the Field Reconnaissance[1]

Common name	Scientific name	Locations
Canada thistle	*Cirsium arvense*	Common and widespread. Observed in small patches in barrow pits and pastures throughout the area, and particularly at the Great Falls Industrial Park site and along Box Elder Creek near the crossing of the fresh and waste water pipeline corridor.
Field bindweed	*Convolvus arvensis*	Common. Spotty distribution along road edges, barrow pits and fields. Observed at the Great Falls Industrial Park site.
Whitetop	*Cardraria draba*	Spotty. Observed along Box Elder Creek near the crossing of the fresh and waste water pipeline corridor, and in incised drainages and mesic sites along the Missouri River.
Leafy spurge	*Euphorbia esula*	Spotty in small patches near the existing Great Falls substation and in incised drainages along the north shore of the Missouri River between Rainbow and Cochrane Dams.
Spotted knapweed	*Centaurea maculosa*	Common and widespread in incised drainages and uplands along the Missouri River.
Dalmatian toadflax	*Linaria dalmatica*	Observed along Highway 87/89 near Malmstrom AFB. May be more widely distributed than observed.

[1]Source: WESTECH, 2006f

3.5 ACOUSTIC ENVIRONMENT

3.5.1 NOISE TERMINOLOGY

Noise is generally defined as "unwanted sound." It varies enormously, and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment. Human and animal perception of noise is affected by intensity, frequency, pitch and duration, as well as the auditory system and physiology of the animal. Noise levels heard by humans and animals are dependent on several variables, including distance, ground cover, and objects or barriers between the source and the receiver, as well as atmospheric conditions.

The loudest sounds that can be detected comfortably by the human ear have intensities that are 1 trillion (1,000,000,000,000) times larger than those of sounds that are barely audible. Because of this vast range, a logarithmic unit known as the decibel (dB) is used to represent the intensity of a sound. Such a representation is called a sound level. Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies, and the "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing. Common noise levels and their effects on the human ear are shown in Table 3-13.

Table 3-13. Common Noise Levels and Their Effects on the Human Ear

Source	Decibel Level (dBA)	Exposure Concern
Soft Whisper	30	Normal safe levels.
Quiet Office	40	
Average Home	50	
Conversational Speech	66	
Busy Traffic	75	May affect hearing in some individuals depending on sensitivity, exposure length, etc.
Noisy Restaurant	80	
Average Factory	80 – 90	
Pneumatic Drill	100	Continued exposure to noise over 90 dB may eventually cause hearing impairment.
Automobile Horn	120	

(DOD, 1978)

Certain land uses, facilities, and the people associated with these noise levels are more sensitive to a given level of noise than other uses. Such "sensitive receptors" include schools, churches, hospitals, retirement homes, campgrounds, wilderness areas, hiking trails, and some species of threatened or endangered wildlife. Recommended land use and associated noise levels developed by the Dept. of Housing and Urban Development (HUD) are illustrated in Table 3-14.

Table 3-14. Recommended Land Use Noise Levels

Land Use Category	Ldn Noise Levels (dBA)			
	Clearly Acceptable	Normally Acceptable	Normally Unacceptable	Clearly Unacceptable
Residential	< 60	60-65	65-75	> 75
Commercial, Retail	< 65	65-75	75-80	> 85
Commercial, Wholesale	< 70	70-80	80-85	> 85
Manufacturing	< 55	55-70	70-80	> 80
Agriculture, Farming	< 75	> 75		
Natural Recreation Areas	< 60	60-75	75-85	> 85
Hospitals	< 60	60-65	65-75	> 75
Schools	< 60	60-65	65-75	> 75
Libraries	< 60	60-65	65-75	> 75
Churches	< 60	60-65	65-75	> 75
Nursing Homes	< 60	60-65	65-75	> 75
Playgrounds	< 55	55-65	65-75	> 75

(HUD, 1991)

For environmental noise studies, noise levels are typically described using A-weighted equivalent noise levels, Leq, during a certain time period. The Leq metric is useful because it uses a single number to describe the constantly fluctuating instantaneous ambient noise levels at a receptor location during a period of time, and accounts for all of the noises and quiet periods that occur during that time period.

The 90th percentile-exceeded noise level, L_{90}, is a metric that indicates the single noise level that is exceeded during 90 percent of a measurement period, although the actual instantaneous noise levels fluctuate continuously. The L_{90} noise level is typically considered the ambient noise level, and is often near the low end of the instantaneous noise levels during a measurement period. It typically does not include the influence of discrete noises of short duration, such as car doors closing, bird chirps, dog barks, car horns, wind gusts, etc. For example, if a continuously operating piece of equipment is audible at a measurement location, typically it is the noise created by the equipment that determines the L_{90} of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment during the same measurement period (BSA, 2005).

The day-night average noise level, L_{dn}, is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. The L_{dn} is typically calculated using 24 consecutive one-hour L_{eq} noise levels. The L_{dn} includes a 10 dBA penalty that is added to noises which occur during the nighttime hours between 10:00 p.m. and 7:00 a.m. to account for people's higher sensitivity to noise at night when the background noise level is typically low.

The ambient noise at a receptor location in a given environment is the all-encompassing sound associated with that environment, and is due to the combination of noise sources from many directions, near and far, including the noise source of interest. Noise levels typically decrease by approximately 6 dBA every time the distance between the source and receptor is doubled, depending on the characteristics of the source and the conditions over the path that the noise travels. A 6 dBA change in noise level is clearly perceptible to most people, and a 10-dBA increase in noise level is judged by most people as doubling of the sound level. The reduction or attenuation in noise levels is increased if a solid barrier – such as a man-made wall or building – or natural topography, blocks the direct line-of-sight (and noise propagation) between the noise source and receptor.

3.5.2 Noise Guidelines

Federal guidelines as well as City of Great Falls noise regulations or ordinances exist that may govern environmental noise levels or to limit noise generated by the Proposed Action. As a result of the Noise Control Act of 1972, the U.S. Environmental Protection Agency (EPA) developed acceptable noise levels under various conditions that would protect public health and welfare with an adequate margin of safety. EPA identified outdoor L_{dn} noise levels less than or equal to 55 dBA as sufficient to protect public health and welfare in residential areas and other places where quiet is a basis for use (EPA, 1979). Although the EPA guideline is not an enforceable regulation, it is a commonly accepted target noise level for environmental noise studies. Both NEPA and the Endangered Species Act (1973) define noise-related disturbances on wildlife as "harassment". No guidelines or regulations have been developed to quantify animal annoyance noise levels, and there are no well-established limits or standards for limiting noise exposure in animals (Bowles, 1995).

Train noise is regulated through the Federal Railroad Administration (49 CFR 210 and 40 CFR 201). A partial summary of the railroad noise standards is listed in Table 3-15.

Table 3-15. Summary of Railroad Noise Standards (40 CFR 201)

Noise Source	Noise Level at 100 feet (dBA)	Noise Level at Receiving Property Line (dBA)
Locomotive – stationary, idle throttle setting.	70	65
Locomotive – stationary, all other throttle settings.	87	65
Locomotive – moving.	90	65
Rail car operations – moving at speeds of 45 mph or less.	88	65
Rail car operations – moving at speeds greater than 45 mph.	93	65

Notes: Locomotive standards listed are for equipment manufactured after December 31, 1979.
Source: BSA, 2005

The Montana Department of Transportation (MDT) determines traffic noise impacts based on the noise levels generated by peak-hour traffic. The MDT criteria state that traffic noise impacts

occur if predicted one-hour $L_{eq}(h)$ traffic noise levels are 66 dBA or greater at a residential property during the peak traffic hour (MDT, 2001a).

The City of Great Falls has a noise ordinance defined in the municipal code (City of Great Falls, 2005a). Tables 3-16 and 3-17 list the noise ordinance limitations.

Table 3-16. Noise Level Limitations for Structures and Open Spaces – Great Falls Municipal Code

Zoning District	Daytime Noise Level Limit (8 a.m. to 8 p.m.)	Nighttime Noise Level Limit (8 p.m. to 8 a.m.)
Residential	55 dBA	50 dBA
Light commercial	65 dBA	60 dBA
Heavy commercial	70 dBA	65 dBA
Industrial	80 dBA	75 dBA

Notes:
1 At boundaries between zones, the lower noise level shall be applicable.
2 Construction projects shall be subject to the maximum permissible noise levels specified for industrial districts.
3 All railroad right-of-ways and the operation of trains shall be considered as industrial districts.
4 Source: City of Great Falls 2005a; BSA, 2005.

Table 3-17. Maximum Permissible Noise Levels for Motor Vehicles – Great Falls Municipal Code

Vehicle Type	Weight	Maximum Noise Level Measured at 50 feet (dBA)	Maximum Noise Level Measured at 25 feet (dBA)
Trucks and buses	Over 10,000 pounds	82	88
	Under 10,000 pounds	74	80
Passenger cars and motorcycles	NA	74	80

Source: City of Great Falls 2005a; BSA, 2005

The Salem and Industrial Park sites both are located in unincorporated areas of Cascade County. However, according to the City of Great Falls planning department, SME has approached the City regarding annexation. If either site is annexed into the City, then the City noise ordinance would be applicable for the specified zoning district. For example, the malt plant located adjacent to and northeast of the Industrial Park Site was recently annexed into the City and zoned I2 – Heavy Industrial. The City noise ordinance also is applicable for transportation (e.g., trains and heavy trucks) of power plant materials through the City limits (City of Great Falls 2005b).

3.5.3 EXISTING ACOUSTIC ENVIRONMENT AT BOTH ALTERNATIVE SITES

The Salem site is located in a rural area approximately eight miles (13 km) east of Great Falls in Cascade County. The surrounding land use is agricultural with scattered rural residences. Approximately eight residences are located within three miles of the Salem Site, and the closest residence is located about 0.5-mile (0.8-km) northwest. A Lewis and Clark Interpretative site (i.e., the Portage Staging Area) is located about one mile north, the Morony Dam on the Missouri River is located approximately 1.5 miles (2.4 km) northwest, and the closest point on Belt Creek is located approximately 1.5 miles northeast. Primary noise sources include traffic on county roads, noise generated by wind blowing through grass, water flowing in nearby creeks, wildlife, insects, birds, and aircraft flying overhead (BSA, 2005). These noise sources are characteristic of rural settings.

The Industrial Park site is located in Cascade County, Montana northeast of Great Falls and about 0.5 mile (0.8 km) north of Black Eagle. The surrounding land use is mixed with residential, commercial, and industrial uses, which are primarily unincorporated. Approximately seven groups of residences are located within one mile of the Industrial Park site, primarily along Black Eagle Road, Rainbow Dam Road, and Bootlegger Trail. Primary noise sources include traffic, industrial equipment (e.g., large fans), wind-generated noise, insects, birds, and aircraft flying overhead (BSA, 2005). The more developed condition of the Industrial Park site is reflected in these predominantly artificial noise sources compared to the predominantly natural noise sources of the Salem location.

In late August and early September 2005, the acoustical consulting firm Big Sky Acoustics (BSA) conducted ambient (background) noise level measurements at both the Salem and Industrial Park sites in general accordance with the American Society for Testing and Materials (ASTM) E1014, *Standard Guide for Measurement of Outdoor A-weighted Sound Levels* (ASTM, 2000). These measurements were taken to establish the typical ambient noise levels within approximately three miles of the Salem Site and one mile of the Industrial Park Site, where the primary noise sensitive receptors are located. Short-term measurements of 10-minute duration were conducted at a total of seven locations, and the L_{eq} and L_{90} for each 10-minute period were recorded. BSA completed two continuous 24-hour measurements, and the L_{eq} and L_{90} in 30-minute increments were also recorded (BSA, 2005).

Around the Salem Site, the L_{90} ambient short-term noise levels ranged from 20 to 47 dBA, and were influenced by chirping insects. Around the Industrial Park Site, the short term noise levels ranged from L_{90} 28 to 44 dBA, and were influenced by nearby traffic and chirping insects (Table 3-18).

BSA also conducted 24-hour measurements to determine the general existing ambient noise level trends versus time of day in the vicinity of the proposed Salem and Industrial Park sites. The 48 consecutive, 30-minute L_{eq} data were used to calculate the L_{dn} levels at the measurement locations. The measured L_{dn} data at the 24-hour measurement locations are listed in Table 3-19. The calculated noise levels based on the measurements were L_{dn} 47 dBA at the Salem site and L_{dn} 53 dBA at the Industrial Park site. Since the measurements were completed in the summer months, insect noise appears to have influenced the measured L_{dn} values. Based on site

Table 3-18. Measured Short-term Ambient Noise Levels at Salem and Industrial Park Sites

Measurement Location	Date and Start Time (hours)	Measured L_{eq} (dBA)	Measured L_{90} (dBA)	Dominant Noise Sources
Salem Site				
1A	8/25/05 at 2151	29 dBA	25 dBA	Insects chirping.
	8/26/05 at 0837	34 dBA	31 dBA	Insects chirping and wind in grass.
	9/01/05 at 1814	48 dBA	47 dBA	Insects chirping.
1B	8/25/05 at 2211	22 dBA	20 dBA	Insects chirping.
	9/01/05 at 1832	46 dBA	45 dBA	Insects chirping.
1C	8/25/05 at 2241	28 dBA	23 dBA	Insects chirping.
	9/01/05 at 1843	47 dBA	38 dBA	Insects and birds chirping.
Industrial Park Site				
2A	8/25/05 at 2325	37 dBA	31 dBA	Pump station hum.
	9/01/05 at 1640	38 dBA	34 dBA	Insects chirping.
2B	8/25/05 at 2344	42 dBA	38 dBA	Traffic on US 87 and insects chirping.
	8/26/05 at 1024	52 dBA	44 dBA	Traffic on 36th Avenue NE, insects chirping, and heavy equipment to south.
	9/01/05 at 1721	45 dBA	39 dBA	Traffic on 26th Avenue NE and insects chirping.
2C	8/26/05 at 0002	41 dBA	39 dBA	Hum of industrial machinery to the west.
	8/26/05 at 1048	48 dBA	44 dBA	Traffic on US 87 and Rainbow Dam Road.
	9/01/05 at 1602	49 dBA	39 dBA	Traffic on Rainbow Dam Road.
2D	8/26/05 at 0020	31 dBA	28 dBA	Insects chirping.
	9/01/05 at 1622	42 dBA	35 dBA	Insects chirping.

Source: BSA, 2005

observations and the 10-minute measurement results around each site (Table 3-16), the estimated L_{dn} values during quiet periods would be approximately L_{dn} 30 dBA at the Salem site and L_{dn} 45 dBA at the Industrial Park site.

Table 3-19. Long-term 24-hour Ambient Noise Levels at Salem and Industrial Park Sites

Measurement Location	Site	Date and Time (hours)	Calculated L_{dn} (dBA)	Estimated L_{dn} During Quiet Periods (dBA)
1	Salem	8/31/05 at 1800 to 9/01/05 at 1800	47 dBA	30 dBA
2	Industrial Park	8/31/05 at 1730 to 9/01/05 at 1730	53 dBA	45 dBA

Source: BSA, 2005

At the Salem site, the L_{90} ambient noise levels were 18 to 35 dBA from 8:00 p.m. to 8.00 a.m., which is typical for quiet rural environments at night. At the Industrial Park site, the L_{90} ambient noise levels were 36 to 45 dBA from 8:00 p.m. to 8:00 a.m., which is typical for quiet suburban areas at night (Harris, 1998). At both locations, L_{90} ambient noise levels were substantially higher during the daytime (8:00 a.m. to 8:00 p.m.) (Figures 3-32 and 3-33).

Figure 3-32. Measured 24-hour Ambient Noise Levels – Salem Site

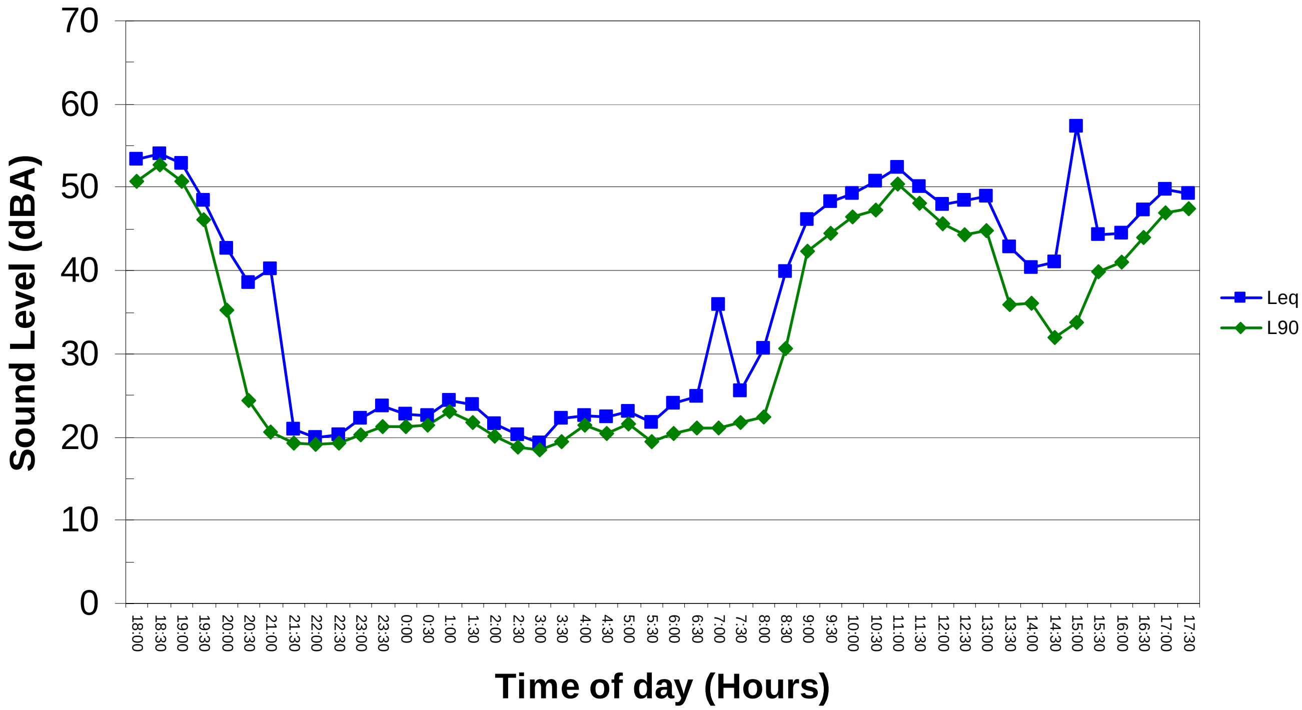
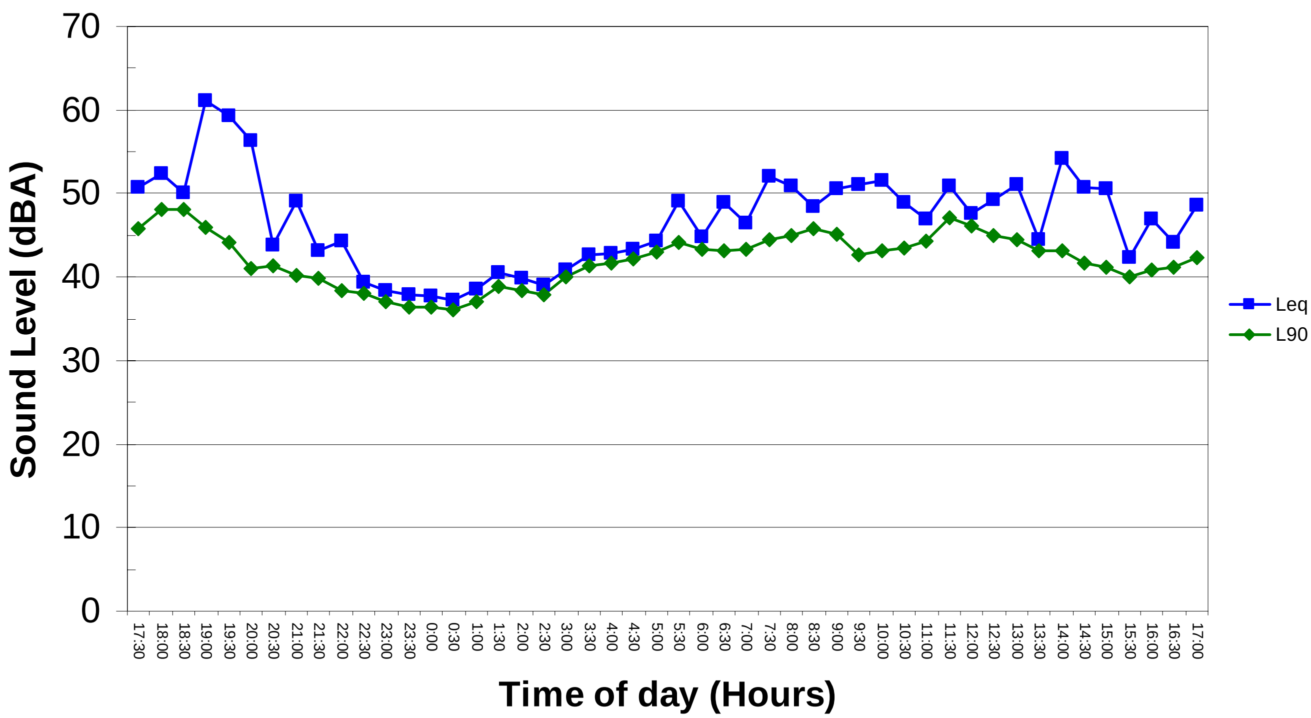


Figure 3-33. Measured 24-hour Ambient Noise Levels – Industrial Park Site



3.6 RECREATION

Montana's rugged outdoors is justly celebrated for the outstanding recreational opportunities it provides residents and visitors alike. The state boasts two national parks – Yellowstone and Glacier – that are internationally famous for their scenery, wilderness and wildlife. Set aside in 1872 and best-known for its geysers and geothermal activity, Yellowstone National Park, most of which is in Wyoming, was the first national park established not only in the United States but the entire world, initiating a global "national parks movement" that continues to this day. Renowned for its spectacular lakes, steep mountains, glaciers, and U-shaped, glacier-gouged valleys, Glacier became the country's 10th national park in 1910 (Uhler, 2002), even before the National Park Service itself was created in 1916. Glacier abuts the international border with Alberta and Canada's Waterton National Park, and the two parks form a single unit known as the Glacier-Waterton International Peace Park.

Nine national forests managed by the U.S. Forest Service, concentrated in western Montana, and nearly eight million acres (3.2 million hectares) managed by the Bureau of Land Management (BLM), concentrated in eastern Montana, also furnish facilities and opportunities for hiking, backpacking, camping, fishing, hunting, cross-county and downhill skiing, snowmobiling, "off-roading," boating, canoeing, kayaking, and other recreational pursuits.

In addition to de facto and recommended wilderness areas within Montana's national parks, five designated wilderness areas in national forests and one in a national wildlife refuge are located within 150 miles (240 km) of Great Falls, the Salem site and Industrial Park alternative site: Gates of the Mountains (Helena National Forest), Scapegoat (Lewis and Clark, Lolo, and Helena national forests), Bob Marshall (Flathead, Lolo, and Lewis and Clark national forests), Mission Mountain (Flathead National Forest), UL Bend (Charles M. Russell National Wildlife Refuge), and Anaconda Pintler (Beaverhead-Deerlodge and Bitterroot national forests).

Figure 3-34. Giant Springs State Park astride the Missouri River

Montana Fish, Wildlife & Parks operates the State of Montana's state park system. Four state parks are located within 50 miles (80 km) of Great Falls: Giant Springs, Sluice Boxes, Tower Rock, and Ulm Pishkun (FWP, no date).

Giant Springs State Park (Figures 3-34 and 3-35) is located just outside Great Falls on the Missouri River at river mile 2108, a little more than one mile (1.6 km) upstream of Rainbow Falls. The 851-acre (344-ha) park is about a mile east-

Figure 3-35. Fishing the Missouri River from Giant Springs State Park near Great Falls

southeast of the alternative Industrial Park site and about nine miles west of the preferred Salem site. Giant Springs, discovered by the Lewis and Clark Expedition in 1805, is one of the largest freshwater springs in the world, discharging some156 million gallons of water per day. This day-use park offers visitors an opportunity to picnic by the Missouri River, visit the Giant Springs Trout Hatchery and visitor center, walk along the Rivers Edge Trail, view nearby Rainbow Falls overlook, or visit the neighboring Lewis and Clark Interpretive Center operated by the U.S. Forest Service. Outdoor activities available at Giant Springs State Park include boating, fishing, picnicking, bicycling, and wildlife viewing. Park facilities include a visitor center, group use area, grills, playground, an interpretive trail and sanitation facilities (FWP, no date).

Established in the mid-1970s, Giant Springs State Park encompasses slightly over 3,000 acres (120 ha) in total (most of which is conservation easement). About 90 percent is on the north shore of the Missouri River. The park receives about 160,000 visitors a year (Auchly, 2005).

Sluice Boxes State Park, located in a rugged area that features remains of mines, a railroad, and historic cabins, is situated 28 miles (45 km) southeast of Great Falls on Belt Creek, a tributary of the Missouri River that passes within a mile of the Salem site and discharges into the Missouri two miles (3.2 km) from the Salem site. However, the park is located well upstream – more than 25 miles (40 km) away – of where Belt Creek passes near the proposed HGS site.

Tower Rock State Park, the newest state park in Montana, is located on the Missouri River at river mile 2181, about 33 miles (53 km) southwest of Great Falls. Tower Rock itself is described and named in the journals of Lewis and Clark. As Lewis wrote, “It may be ascended with some difficulty nearly to it's summit and from it there is a most pleasing view of the country we are now about to leave. From it I saw that evening immense herds of buffaloe in the plains below [sic].” This park is about 36 miles (58 km) from Great Falls and the Industrial Park site and more than 40 miles (93 km) from the Salem site.

The Lewis and Clark National Historic Trail Interpretive Center is operated by the U.S. Forest Service. It is located on Giant Springs Road near the state park, above the bluffs overlooking the Missouri River (USFS, 2005). The 25,000 square-foot building includes a permanent exhibit hall, 158-seat theater, an education room for hands-on, curriculum-based activities, and a retail store (Figure 3-36). The center is handicapped accessible and offers parking for tour buses as well as recreational vehicles. Several trails offer outdoor recreation opportunities to learn about plants native to the Northern Plains. This interpretive center is about a mile (1.6 km) east-

southeast of the alternative Industrial Park site and about nine miles (14 km) west of the preferred Salem site. The center's mission is to evoke in the public a personal sense of President Thomas Jefferson's vision of expanding America to the west. It seeks to inspire awe toward the challenges faced by the Corps of Discovery as they portaged the great falls of the Missouri River and explored the 'unknown.' The center also aims to bring to life the daily experiences of the expedition and the environment and native peoples of the 'uncharted West'; and lastly, celebrate "the indomitable spirit of human discovery we all share" (USFS, 2005).

Figure 3-36. Lewis and Clark Interpretive Center

The City of Great Falls Parks and Recreation Department manages and maintains a number of parks within the city limits (CGFPR, no date). The Elks Riverside Park runs along the Missouri River southwest and within a couple of miles of the alternative Industrial Park site. It has picnic shelters and tables, barbecue facilities, open space, tennis courts, horseshoe pits, and restroom facilities. Among its other parks, Great Falls Parks and Recreation also runs the River Side Railroad Skate Park, a park dedicated to skateboarding, and Gibson Park, named for Great Falls' visionary founder Paris Gibson. The Anaconda Hills Golf Course is an 18-hole, public facility about a half-mile south (0.8 km) of the Industrial Park site (TGC, 2004).

Figure 3-37. River Side Railroad Skate Park in Great Falls

The 25-mile (40 km) long River's Edge Trail meanders through the City of Great Falls area, broadly paralleling the Missouri River while connecting parks and other points of interest along the river, including Black Eagle Falls, Rainbow Falls, Crooked Falls and "The Great Falls of the Missouri" just below Ryan Dam (RT, 2000). This public trail is free and open during daylight hours for 365 days of the year to all non-motorized recreationists, including bicyclists, walkers, joggers, runners, roller blading enthusiasts, and others. The trail was developed as a cooperative partnership by the City of Great Falls, Cascade County, the Montana Department of Fish, Wildlife & Parks, the Montana Department of Transportation, the electric utility PPL Montana, a volunteer trail advocacy group (Recreational Trails, Inc.), and a supportive community. Eleven miles (18 km) of the trail are paved and wheelchair accessible; 14 miles (23 km) of the trail run along the Missouri River reservoirs and are gravel or single or double track. North and south

shore trails are served by 11 trailhead parking areas. PPL Montana provides conservation and trail easements on native lands along the reservoirs that comprise much of the gravel and single track portions of the trail.

Figure 3-38. Sign at Entrance to Lewis and Clark Expedition Portage Staging Area near Salem Site

No recreation takes place directly on the two alternative sites for the proposed generating station. The preferred Salem site is a wheat field while the alternative site is former agricultural land that is now within the City of Great Falls' designated Central Montana Agricultural and Technology Park. With regard to the Salem location, the nearest public recreational site of some importance is the Lewis and Clark Expedition staging area historic site about 1.5 miles (2.4 km) away. The staging area includes a wayside along the Salem Road north of the proposed plant site; the wayside contains historic markers/signs describing the Corps of Discovery's month-long portage around the great falls of the Missouri River in June 1805 (Figure 3-38).

On this portion of the Missouri River, recreational fishing requires a warm water game fish stamp (FWP, 2005; Montana fishing regulations). However, fishing opportunities in the Morony Reservoir itself are reported to be non-existent because public access onto PPL-Montana property is prohibited (Urquhart, 2005). No other recreational facilities, parks, or opportunities are close to the Salem site.

The closest recreational sites to the alternative Industrial Park location are the several parks and River's Edge Trail mentioned above that run along the Missouri River. The closest of these is approximately a mile away from the southern edge of the Industrial Park alternative for the proposed SME generating station.

3.7 CULTURAL RESOURCES

Cultural resources are sites, features, structures, or objects that may have significant archaeological and historic values. Additionally, they are properties that may play a significant traditional role in a community's historically based beliefs, customs, and practices. Cultural resources encompass a wide range of sites and buildings from prehistoric campsites to farmsteads constructed in the recent past, as well as traditional cultural properties (TCP) still used today.

Sections 106 and 110 of the National Historic Preservation Act (NHPA, P.L. 89-655) provide the framework for federal review and protection of cultural resources, and ensure that they are considered during federal project planning and execution. The implementing regulations for the Section 106 process (36 CFR Part 800) have been developed by the Advisory Council on Historic Preservation (ACHP). The Secretary of the Interior maintains a National Register of Historic Places (NRHP) and sets forth significance criteria (36 CFR Part 60) for inclusion in the register. Cultural resources may be considered "historic properties" for the purpose of consideration by a federal undertaking if they meet NRHP criteria. The implementing regulations define an undertaking as "a project, activity, or program funded in whole or in part under the direct or indirect jurisdiction of a federal agency, including those carried out by or on behalf of a federal agency; those carried out with federal financial assistance; those requiring a federal permit, license or approval; and those subject to state or local regulation administered pursuant to a delegation or approval by a federal agency." Historic properties may be those that are formally placed in the NRHP by the Secretary of the Interior, those that meet the criteria and are determined eligible for inclusion, and those that are yet undiscovered but may meet eligibility criteria.

3.7.1 CULTURAL RESOURCES INVENTORY

3.7.1.1 Prior Investigations

Archaeologists conducted prefield research for previously recorded cultural resource sites within the general vicinity of the proposed HGS plant site and the alternate Great Falls Industrial Park location, as well as the corridors centered on the HGS's 28.4 miles (45.7 km) of connections (Dickerson, 2005). The prefield research encompassed a records search of the Montana State Historic Preservation Office (SHPO) records center and cultural resource site files at the Department of Anthropology, University of Montana, Missoula.

The file search and literature review revealed that 17 cultural resource investigations have been undertaken within one mile (1.6 km) of the HGS, its 28.4 miles of connections, and the Great Falls Industrial Park alternate plant site. Only two of those projects encompass significant portions of SME's current project area. During the early 1980s, Herbort (1981) conducted a cultural resource inventory of lands encompassing the HGS as well as adjoining areas as part of the Resource 89 Siting project. More recently, Wood (2004a) completed an intensive cultural resource examination and inventory of 328 acres (133 ha) around and within the entire Great Falls Industrial Park alternate plant site.

The 15 additional cultural resource projects previously conducted in the area overlap, or are situated adjacent to areas that SME currently proposes for development. Included are multiple inventory and subsurface testing projects completed for the Missouri-Madison Hydroelectric project (Greiser, 1980; Bowers, 1982; Deaver, 1990, 1991; Deaver and Peterson, 1992; Rossillon, 1992; Rossillon et al., 1993, 2003; Dickerson, 2000), cultural surveys near Giant Spring (Keim, 1997; Wood, 2004b) and Malmstrom Air Force Base (Greiser, 1988; Hoffecker, 1994), and documentation for the Great Northern Railway (Axline, 1995a, 1995b).

A professional archaeologist at Renewable Technologies, Inc. (RTI) completed the cultural resource inventory of the HGS project areas (Salem and Industrial Park sites) in 2005 (Dickerson, 2005). At the Salem site, the inventory encompassed a total of 1,180 acres (478 ha), covering the proposed HGS plant site and various 250-foot wide corridors, totaling 28.4 miles (46 km) in length, where proposed rail spur, electric transmission lines, as well as water intake and discharge pipelines will be located. Wood (2004a) inventoried the Industrial Park site in its entirety in 2004; hence RTI did not resurvey that portion of the project area.

The portion of the project area encompassing the Salem site had been previously inventoried in 1981, however, Montana SHPO staff consider that work to be out-dated and they requested that the area be resurveyed (Warhank, 2005).

The purpose of the RTI investigations of the project area was to: (1) identify any cultural resource properties within the surveyed portions of the project area; (2) provide baseline data regarding cultural resources, their constituents and locations; and (3) to present the current National Register status for each property and/or to provide an evaluation of each site's integrity, historic significance, as well as recommendation for determining National Register eligibility.

Section 3.7.1.2 presents a summary of the methodology for the cultural resources surveys conducted for SME's project areas. Section 3.7.1.3 presents a summary of the cultural resources located at the HGS and related connection lines. No cultural resources were found within the project boundaries of the alternate Industrial Park site during the 2004 project conducted by Wood, so no summary data are provided here.

3.7.1.2 Inventory Methodology

Prefield Research

Existing and readily available cultural site records, notes, maps, project reports, and related literature for previous cultural resource investigations within the project vicinity were collected and reviewed by RTI staff. A literature search was conducted at the Montana SHPO in Helena. All types of literature were reviewed to determine the locations of all known cultural resources with, and near, the proposed plant sites and connection line corridors. Additional information concerning specific cultural sites was obtained from the University of Montana, Department of Anthropology Archaeological Records Office in Missoula.

The identified previous cultural resource studies resulted in the identification and documentation of 21 historic and prehistoric sites located within one mile (1.6 km) of SME's proposed plant sites and connection corridors. Due to the sensitivity of cultural site location information, and its protection under federal and state laws, the locations of the various cultural sites are not presented in this document. Figure 4 in the RTI report (Dickerson, 2005:11) presents such information.

The largest of the sites is the Great Falls Portage National Historic Landmark. Many of the remaining sites are associated with historic hydroelectric developments at the Rainbow, Ryan, and Morony facilities (Dickerson, 2005:10). Other historic sites include the Giant Spring fish

hatchery and access road, the Great Northern railway, the Chicago, Milwaukee, St. Paul, and Pacific railway, the Malmstrom Air Force Base Aircraft Alert Facility building, and multiple small trash dumps.

Prehistoric cultural properties are few and broadly dispersed in the project vicinity. They consist primarily of lithic scatters and sites containing small numbers of stone circles or stacked-rock cairns.

Only five of the above mentioned, previously recorded cultural properties lie within SME's project area. These sites include the Great Falls Portage National Historic Landmark (24CA238), the Chicago, Milwaukee, St. Paul, and Pacific Railroad (24CA264), historic transmission lines associated with the Morony (24CA289, Feature 2) and Rainbow (24CA291, Feature 34) hydroelectric facilities, and the Rainbow-Ryan Road (24CA416). The remaining 16 previously recorded sites are situated outside SME's project area.

Field Inventory

In 2004, Gar C. Wood and Associates (Wood, 2004a) conducted the cultural resource inventory of the area presently considered as the alternate Industrial Park site. The inventory used currently established standards from the MT SHPO and US Secretary of Interior for cultural resource pedestrian survey, inventory, analysis and recording. No sites were found or recorded within the alternate Industrial Park site area. No further discussion related to cultural resources for this particular site is warranted.

Figure 3-39 depicts the Area of Potential Effect (APE) of the Proposed Action, in particular the HGS Salem site. As noted in the figure, it includes a rectangular area whose length runs east-west and whose width runs north-south. The southwest corner of the APE is in the City of Great Falls, while the eastern and northern sides lie several miles east and north of the Salem site, respectively. Figure 3-39 shows key components of the Proposed Action as well as previously recorded and newly recorded historic properties.

Area of Potential Effect (APE)

Section 106 of the National Historic Preservation Act requires federal agencies to define and document the APE of "federal undertakings" in consultation with the SHPO. The reason for defining an APE is to determine the area in which historic properties must be identified, so that effects to any identified properties can, in turn, be assessed.

According to 36 CFR 800.16(d), the Area of Potential Effect is the **geographic area** or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if such properties exist. The area of potential effects is influenced by the **scale and nature of the undertaking** and may be different for different kinds of **effects** caused by the undertaking.

The APE should include:

- all alternative locations for all elements of the undertaking
- all locations where the undertaking may result in ground disturbance
- all locations from which elements of the undertaking (e.g. structures or land disturbance) may be visible or audible; and
- all locations where the activity may result in changes in traffic patterns, land use, public access, etc.

RTI's 2005 inventory of the proposed Salem plant site and related 28.4 miles (46 km) of connection lines were also conducted utilizing currently accepted professional standards for cultural resource survey, inventory, and recording. RTI staff conducted an intensive pedestrian cultural resource inventory of the project area during the period of October 4-13, 2005. The area examined in 2005 covered 1,180 acres (478 ha). Field work involved walking parallel transects spaced no more than 30 meters (100 feet) apart. Specific details of the survey methodology are contained in the project report (Dickerson, 2005:12-13). Field documentation consisted of marking exact site locations on topographic maps, measuring property dimensions, and describing the nature and extent of all cultural remains. Selected artifacts and cultural features were photographed. Site maps were produced showing the relative locations of all documented remains. No subsurface testing was conducted, nor were any cultural materials collected.

Historic Research

During the current investigation, RTI consulted a myriad of sources to gather information about the documented historic sites. Maps were reviewed that display the routes of historic roads and rail lines. An informal interview was made of the local resident of an area farmstead (Dickerson, 2005:13). Numerous cultural resource reports and historic overviews were consulted for information directly pertaining to historic development of the Great Falls hydroelectric facilities as well as the Chicago, Milwaukee, St. Paul, and Pacific Railroad's (Milwaukee Road) North Montana Line. Additionally, county land and title records were examined for information of historic title transfers for all recorded farmsteads within the project area.

Previously recorded cultural sites were reexamined with amendments made to existing Montana Cultural Resource Inventory System (CRIS) site forms. All newly discovered sites were recorded on CRIS forms.

3.7.2 Inventory Results

Ten cultural properties lie within the APE of SME's HGS Salem site. The ten include five previously recorded sites, and five discovered and recorded as part of the recent project (Dickerson, 2005:13). Nine of the ten sites were fully recorded or amended. One newly discovered farmstead (field number RTI-05025-04) was identified but not fully documented due to lack of access to the property. All of the properties are affiliated with the historic period.

Table 3-20 presents a list of the 10 sites documented within the project area. The sites include the Great Falls Portage National Historic Landmark (24CA238), the Chicago, Milwaukee, St. Paul & Pacific Railroad (24CA264), the Morony Transmission Line (24CA289, Feature 2), the Rainbow Transmission Line (24CA291, Feature 34), the Rainbow-Ryan Road (24CA416), three historic farmsteads (24CA986, 24CA987, and 24CA988), the Cooper Railroad Siding (24CA989), and another historic farmstead that has not been fully recorded (temporary field number RTI-05025-4).

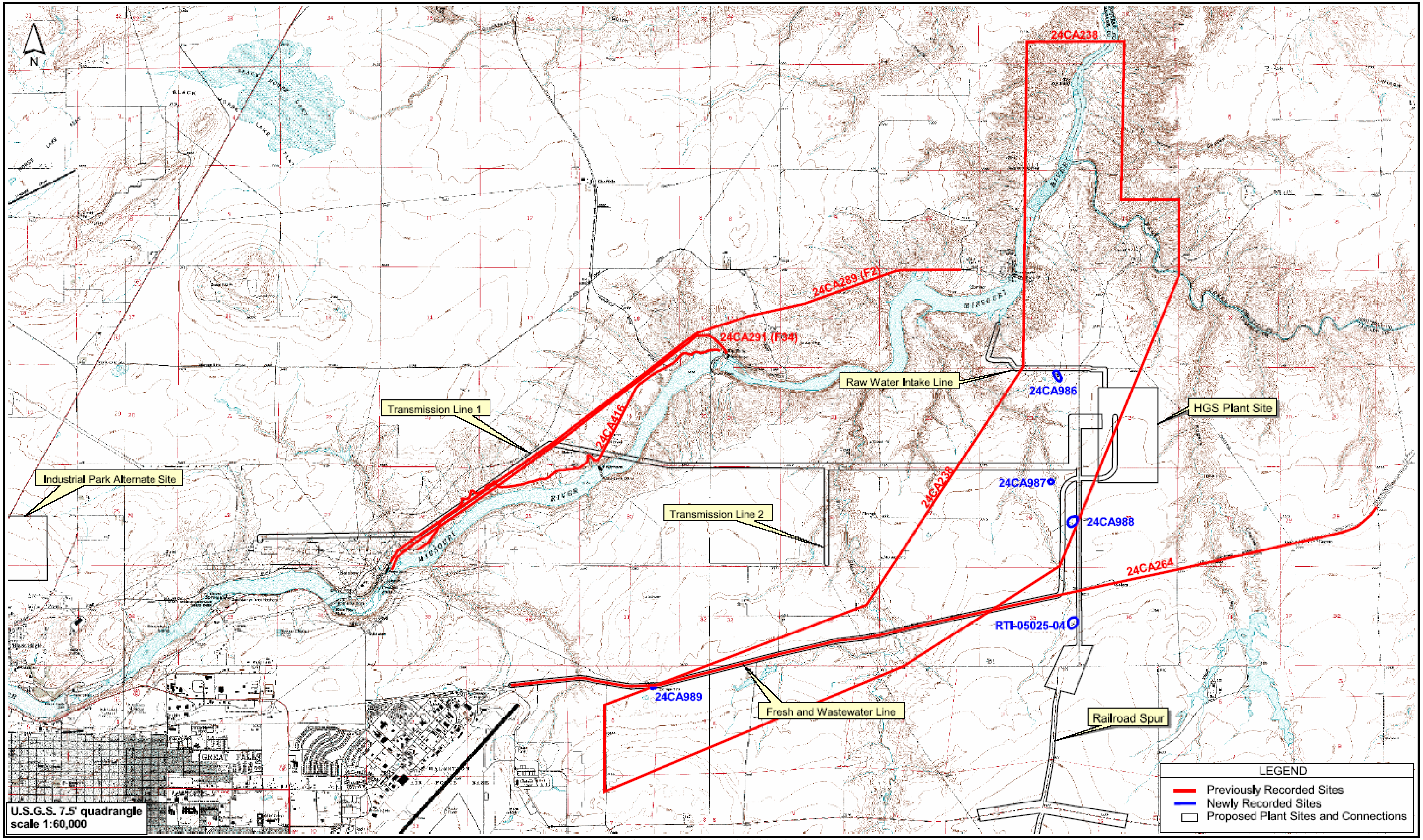


Figure 3-39. Area of Potential Effect of the Highwood Generating Station at the Salem Site

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Table 3-20. Cultural Sites Documented Within SME's Project Area

Site Number	Description	Legal Location*	National Register Eligibility/Status
24CA238	Great Falls Portage National Historic Landmark	T20N, R5E, Secs 3-7; T21N, R5E, Secs 13-14, 23-27, 33-35	Listed, National Historic Landmark
24CA264	Chicago, Milwaukee, St. Paul & Pacific Railroad	T20N, R4E, Sec 1; T20N, R5E, Secs 5, 6; T21N, R5E, Secs 32-35	Eligible; portion lying within SME's project area is a non-contributing element
24CA289 Feature 2	Morony Transmission Line	T21N, R4E, Secs 24-26	Contributing Element of an Eligible District
24CA291 Feature 34	Rainbow Transmission Line	T21N, R4E, Secs 24-26	Contributing Element of an Eligible District
24CA416	Rainbow-Ryan Road	T21N, R4E, Secs 25, 26; T21N, R5E, Sec 19	Eligible
24CA986	Historic Farmstead	T21N, R5E, Sec 23	Ineligible
24CA987	Historic Farmstead	T21N, R5E, Sec 26	Ineligible
24CA988	Historic Farmstead	T21N, R5E, Sec 26	Ineligible
24CA989	Cooper Siding	T20N, R5E, Sec 6	Ineligible
RTI-05025-4	Historic Farmstead	T21N, R5E, Sec 35	Unevaluated; presumed ineligible**

Source: Dickerson, 2005

* The legal locations listed above encompass only those portions of sites situated within SME's project area.

** Property RTI-05025-4 was noted in the field, but not formally recorded or evaluated for National Register eligibility.

Detailed descriptions and record forms for each site are contained in the project report: *Southern Montana Electric Generation and Transmission Cooperative's Highwood Generating Station, Cascade County, Montana: Cultural Resource Inventory and Evaluation* (Dickerson, 2005).

<u>The Great Falls Portage National Historic Landmark (24CA238)</u> (Figure 3-40) is a historic landscape area associated with the portage of the Lewis and Clarke, Corps of Discovery, travels around the Great Falls of the Missouri River in 1805. <u>The site was designated as a National Historic Landmark on May 23, 1966, but its formal boundaries were not approved until June 17, 1985.</u> The Great Falls Portage National Historic Landmark (NHL) is an approximately one-mile (1.6-km) wide discontinuous corridor spanning from the lower portage camp, located immediately north of the mouth of Belt Creek, to White Bear Island at the southern outskirts of Great Falls. RTI's 2005 inventory covered portions of the northern section of the NHL corridor extending northeast from the eastern boundary of Malmstrom Air Force Base. Within the inventory project area, RTI found no physical evidence of the Corps of Discovery's portage activities. No camp features, artifacts, or similar evidence <u>were</u> found on the surface.

<u>Chicago, Milwaukee, St. Paul & Pacific Railroad (Milwaukee Road) (24CA264)</u> (Figure 3-41) A 5.5-mile (8.9-km) section of the Milwaukee Road's North Montana Line east of Malmstrom Air Force Base lies within the current project area. SME proposes to bury fresh- and waste-water discharge lines within a section of the railroad grade extending from the HGS to points connecting with the Great Falls potable water and wastewater systems.

Figure 3-40. View of the Great Falls Portage National Historic Landmark's (24CA238), Northern End with Morony Dam in the Center and Belt Creek Canyon in the Distance

Figure 3-41. View toward East-Northeast of 242A262, the Historic Chicago, Milwaukee, St. Paul & Pacific Railroad

This historic period linear site consists of discontinuous sections of the Milwaukee Road and its spur lines in the Great Falls area. The property has been documented and described by several authors, a summary of which is provided by Dickerson (2005:20-21). A 5.5-mile (8.9 km) long section of the Milwaukee Road North Montana Line located east of Malmstrom Air Force Base lies within the current project area. The Milwaukee Road linear site, in its entirety within

Cascade County, has been recommended as eligible for listing on the National Register (Dickerson, 2005:22), however due to a lack of integrity exhibited by the 5.5-mile (8.9-km) segment within the proposed SME project area, Dickerson proposes that the particular segment to be a non-contributing element of the historic property.

Morony Transmission Line (24CA289, Feature 2) and Rainbow Transmission Line (24CA291, Feature 34) SME proposes to construct a new overhead transmission line that will run from the HGS to the Great Falls Switchyard. The new transmission line will cross the historic lines in one location and will run parallel for the remainder of the project area.

These historic sites constitute two parallel electric transmission lines recorded within the project area. The lines are associated with the Morony and Rainbow hydroelectric facilities constructed in the early 1900's. The historic electric transmission lines through the project area are contributing elements to the National Register eligible property of the Great Falls Historic Hydroelectric District (RTI, 1991: Section 7, page 30; Rossillon et al., 2003:28-30). It is understood that the transmission lines played integral roles in the early twentieth century development of the Missouri-Madison hydroelectric system.

Rainbow-Ryan Road (24CA416) Approximately 0.75 mile (1.2 km) of the historic road grade is within SME's project area.

Constructed in the 1920's to aid access between the Rainbow and Ryan power plants, the road was reconstructed as part of Montana's WPA-funded highway program in 1939. The roadway within the subject project area consists of a 22-foot wide graded gravel surface with four crossing structures consisting of three culverts with stone headwalls and one timber bridge with stone abutments. Previous and recent investigators of this site have recommended that the property is eligible for listing on the National Register. Investigators have considered the site eligible for National Register listing because it embodies significant design qualities and construction techniques used for secondary highways constructed with Public Works funds during the Depression era (Rossillon et al., 2003:34).

Historic Urquhart Farmstead (24CA986) The site is about 0.5 mile (0.8 km) northwest of the HGS. SME proposes to construct a buried raw-water intake pipeline immediately north of the farmstead.

The historic Urquhart Farmstead has structures which post-date the purchase by the Urquhart family in 1929. There are 11 historic buildings (pre-1955) on the property that continue in use as a family farm. According to the recent investigation (Dickerson 2005:32), the property appears to lack integrity of materials, design, and workmanship, thus making the recommendation that it is not eligible for listing on the National Register.

Historic Somppi Farmstead (24CA987) The farmstead is 0.5 mile (0.8 km) southwest of the Salem site of the HGS. SME proposes to construct two overhead electric transmission lines immediately north of the site and to bury fresh- and waste-water pipelines to the southeast. John Somppi acquired the property, on which the documented historic structures are associated, during the period of 1934 to 1946 (Dickerson, 2005:34). There are three historic buildings

including a house, granary, and a shed. All of the buildings have been abandoned for many years and are in relatively poor condition. The recent documentation of the historic property suggests that the farmstead lacks historic integrity. Many of the buildings have been moved to their current locations from other locations. Because the historic arrangement of the small farmstead has been extensively altered, the investigator recommends that the property is not eligible for listing on the National Register.

Historic Kantola Farmstead (24CA988) The site is situated over one-half mile (0.8 km) southwest of the HGS. SME proposes to construct a railroad spur line within the Salem Road corridor immediately adjacent to the farmstead, and to install underground fresh- and waste-water pipelines immediately west of the property.

The land on which the site is located was patented by Victor Kantola in 1913 and the property remains in the ownership of the Kantola family to the present day (Dickerson, 2005:36). All improvements to the property post-date 1913 with many of the structures apparently constructed after 1920. There are eight historic buildings on the site, including an historic schoolhouse that was moved to the site. The historic farm house has been subjected to considerable alterations that compromise its original form, scale, and materials. Several of the buildings are not on their original sites, but were moved to the farm for re-use. The author of the recent investigation is recommending that due to a lack of integrity, the farmstead is not eligible for listing on the National Register.

Cooper Siding (24CA989) SME proposes to install buried fresh- and waste-water pipelines within the historic railroad bed.

Cooper was one of many sidings along the North Montana Line of the Milwaukee Road. The historic siding was used beginning in the 1940's. A grain elevator was constructed adjacent to the tracks sometime prior to 1954. The line was abandoned in 1980, and the rails and ties were removed. The land later reverted to the ownership of adjacent land owners. The investigator of the recent study indicates that the Cooper Siding lacks historic integrity because almost all of the original buildings have been demolished (Dickerson 2005:25). The remains of the site do not easily convey an indication of the site's original function. In this regard, it has been recommended that the site is not eligible for listing on the National Register.

Historic Farmstead (unrecorded, RTI-05035-4) During the recent inventory and investigation, RTI noted this potentially historic farmstead. The site is located immediately west of SME's proposed railroad spur and south of the fresh- and waste-water pipelines.

The current owner did not grant RTI access to the property; therefore, formal investigation and recording could not be accomplished. The site was only briefly noted in the project report. The property contains at least seven historic buildings, including an historic house that has been extensively altered during the modern period. It is presumed from records search and a cursory and distant viewing of the property that the structures were possibly constructed sometime during the 1920's to 1930's. The investigators have presumed that, due to an apparent lack of integrity and significance, the site is potentially not eligible for listing on the National Register.

3.7.3 Traditional Cultural Properties

On January 20, 2006, RUS sent letters to eight organizations in the Montana-Wyoming Tribal Leaders Council – including the Blackfeet Tribal Business Council, Crow Tribal Council, Chippewa Cree Business Committee, Fort Belknap Community Council, Fort Peck Tribal Executive Board, Little Shell Tribe of Chippewa Indians of Montana, Northern Cheyenne Tribal Council, and Salish & Kootenai Tribal Council – informing them of the Proposed Action and EIS process and inviting comment and participation. In addition, identical letters were sent to Tribal Historic Preservation Officers at the Blackfeet Nation, the Chippewa Cree Tribe of the Rocky Boy's Reservation, the Fort Belknap Indian Community, the Northern Cheyenne Tribe, and the Confederated Salish and Kootenai Tribes of the Flathead Reservation.

By way of this letter, RUS formally requested consultation with the tribes on SME's proposal. RUS also asked tribal representatives to advise RUS if they have specific concerns regarding either of the proposed locations of the HGS, and in particular, for any information they may have on the possible presence of Traditional Cultural Properties (TCPs) or sacred sites at either of the proposed locations under study.

Traditional Cultural Property (TCP)

A Traditional Cultural Property (TCP) can generally be defined as a property that is eligible for inclusion on the National Register of Historic Places because of its association with cultural practices or beliefs of a living community that are important in maintaining the continuing cultural identity of the community. TCPs are essential to maintaining the cultural integrity of many Native American Indian nations and are critical to the cultural lives of many of their communities.

TCPs are often hard to recognize and may not come to light through conducing archeological or historical surveys. The existence and significance of such locations often can be ascertained only through interviews and consultation with traditional cultural practitioners. Moreover, it must be recognized that requiring religious practitioners to fully disclose their beliefs about a traditional place may, from their perspective, require them to violate tradition in a manner that they believe to be destructive to the place, their culture and themselves.

Due to the unique circumstances surrounding government-to-government consultation, it is incumbent upon the Federal Government to respectfully balance Native American Indian cultural values with other public interests and to view potential TCPs in a culturally sensitive manner in federal agency planning and program implementation.

Two responses were received from tribes to this request for consultation. The Northern Cheyenne Tribe expressed concern about cumulative air quality impacts and asked to receive the Draft EIS. The Blackfeet Tribal Historic Preservation Office requested a site visit, which was held on March 24, 2006. Two representatives of the Blackfeet Tribal Historic Preservation Office in Browning, MT met with the manager of SME and Montana Rural Development's Native American Coordinator and were given a tour of both possible sites and an explanation of the Proposed Action.

To date, no TCPs have been identified at either the Salem site or the Industrial Park site.

3.8 VISUAL RESOURCES

3.8.1 TERMINOLOGY AND METHODOLOGY

In environmental analysis, the term “visual resources” is often used interchangeably with “scenic resources” or “aesthetics.” The very notion of visual resources or a “viewshed” denotes an interaction between a human observer and the landscape he or she is observing. The inherently subjective response of the observant human viewer to the various natural and/or artificial elements of a given landscape and the arrangement and interaction between them is at the heart of visual resources impacts analysis.

A related term, visual quality, is what viewers like and dislike about the visual resources which comprise a particular scene. While different viewers may evaluate visual resources in different lights, there is a broad consensus that, say, views of Glacier National Park’s St. Mary Lake possess higher visual quality than views of, say, economically depressed urban settings or industrial facilities. Almost all observers would prefer to see the Grand Canyon of the Colorado River in Arizona when the air is crisp and clear, and the opposite rim visible in sharp relief, rather than when haze and smog from various sources obscure the vista. But as to whether a view of the Grand Canyon has higher visual quality than a view of Manhattan’s skyline depends entirely on the observer’s values, aesthetic sensibilities, and subjective preferences. Neighbors and travelers may, in particular, have different opinions on what they like and dislike about a scene. Viewers tend to define visual quality in terms of natural harmony, cultural order, and project coherence (MNDOT, 2005).

A “viewshed” is a subset of a landscape unit and consists of all the surface areas visible from an observer’s viewpoint. The limits of a viewshed are defined as the visual limits of the views located from the proposed project. A viewshed also includes the locations of viewers likely to be affected by visual changes brought about by project features (Caltrans, no date).

Americans look to the American countryside, and especially the landscapes of their public lands, as a source of inspiration and to provide places to escape modern/urban routines/settings and enjoy the beauty of nature firsthand (BLM, 2003c). Federal land management agencies such as the Bureau of Land Management (BLM), U.S. Forest Service, and National Park Service are very concerned with managing and protecting visual resources. Any activities that occur on public lands, such as recreation, mining, timber harvesting, grazing, building and maintaining power transmission lines, or road development for example, have the potential to disturb the surface of the landscape and thus impact or impair scenic values. Visual resource management (VRM) is a system developed by BLM for minimizing the visual impacts of surface-disturbing activities and maintaining scenic values for the future. BLM manages 264 million acres (107 million hectares) – one-eighth of the land area of the U.S. – more than any other federal or state agency in the country. BLM lands are located primarily in 12 Western states and include almost eight million acres (3.2 million hectares) in Montana alone (BLM, 2005; BLM, 2003d).

While BLM's VRM was developed for application on the public lands managed by that agency, it is a useful tool to assess impacts on private lands as well. At a location like the preferred site for the HGS – the Salem site – which, while on private land, is partially located within a National Historic Landmark designated in good part for its scenic values, it also makes sense to use VRM in at least a limited form. VRM consists of two stages – inventory (visual resource inventory) and analysis (visual resource contrast rating).

VRM's visual resource inventory consists of identifying the visual resources of an area and assigning them to inventory classes using BLM's visual resource inventory process (BLM, no date-a). The process involves rating the visual appeal of a tract of land, measuring public concern for scenic quality, and determining whether the tract of land is visible from travel routes or observation points. Based on these three factors, BLM-administered lands are placed into one of four visual resource inventory classes. These inventory classes represent the relative value of the visual resources. Classes I and II are the most valued, Class III represents a moderate value, and Class IV represents the least value.

VRM's analysis stage involves determining whether the potential visual impacts from proposed surface-disturbing activities or developments will meet the management objectives established for the area, or whether design adjustments will be required. A visual contrast rating process is used for this analysis, which involves comparing the project features with the major features in the existing landscape using the basic design elements of form, line, color, and texture.

This EIS utilizes the VRM framework to identify and describe visual resources at the two sites in question. It also uses a simplified version of the VRM approach to rate the impacts of building and operating a coal-burning power plant and appurtenant facilities – primarily the power transmission line interconnectors – at both the Salem and Industrial Park sites. However, this Visual Resources section does not examine the "visibility" issue as it relates to air quality in federal mandatory Class I areas, which are covered in the Air Quality sections (Sections 3.2 and 4.4).

The first step in the VRM Visual Resource Inventory is the scenic quality evaluation. Scenic quality is a measure of the visual appeal of a tract of land. This evaluation assesses a landscape according to seven key factors and rating criteria: landform, vegetation, water, color, influence of adjacent scenery, scarcity, and cultural modifications (Table 3-21). In the visual resource inventory process, the landscape under evaluation is given an A, B, or C rating based on its aggregate score in the seven rating criteria.

Table 3-21. BLM's VRM Scenic Quality Inventory and Evaluation Chart

Key factors	**Rating Criteria and Score**	.	.
Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features.

	exceptionally striking and intriguing such as glaciers. **5**	not dominant or exceptional. **3**	**1**
Vegetation	A variety of vegetative types as expressed in interesting forms, textures, and patterns. **5**	Some variety of vegetation, but only one or two major types. **3**	Little or no variety or contrast in vegetation. **1**
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5**	Flowing, or still, but not dominant in the landscape. **3**	Absent, or present, but not noticeable. **0**
Color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. **5**	Some intensity or variety in colors and contrast of the soil, rock and vegetation, but not a dominant scenic element. **3**	Subtle color variations, contrast, or interest; generally mute tones. **1**
Influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. **5**	Adjacent scenery moderately enhances overall visual quality. **3**	Adjacent scenery has little or no influence on overall visual quality. **0**
Scarcity	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. *** 5+**	Distinctive, though somewhat similar to others within the region. **3**	Interesting within its setting, but fairly common within the region. **1**
Cultural modifications	Modifications add favorably to visual variety while promoting visual harmony. **2**	Modifications add little or no visual variety to the area, and introduce no discordant elements. **0**	Modifications add variety but are very discordant and promote strong disharmony. **-4**

* A rating of greater than 5 can be given but must be supported by written justification.
Source: BLM, no date-a

SCENIC QUALITY
A = 19 or more
B = 12-18
C = 11 or less

The next step in the VRM visual resource inventory is the sensitivity level analysis. Sensitivity levels are a measure of public concern for scenic quality. The landscape being inventoried is assigned high, medium, or low sensitivity levels by analyzing the various indicators of public concern. These include:

1. Type of Users. Visual sensitivity will vary with the type of users. Recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.

2. Amount of Use. Areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increases.

3. Public Interest. The visual quality of an area may be of concern to local, State, or National groups. Indicators of this concern are usually expressed in public meetings, letters, newspaper or magazine articles, newsletters, land-use plans, etc. Public controversy created in response to proposed activities that would change the landscape character should also be considered.

4. Adjacent Land Uses. The interrelationship with land uses in adjacent lands can affect the visual sensitivity of an area. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be visually sensitive.

5. Special Areas. Management objectives for special areas such as Natural Areas, Wilderness Areas or Wilderness Study Areas, Wild and Scenic Rivers, Scenic Areas, Scenic Roads or Trails, and Areas of Critical Environmental Concern (ACEC), frequently require special consideration for the protection of the visual values. This does not necessarily mean that these areas are scenic, but rather that one of the management objectives may be to preserve the natural landscape setting. The management objectives for these areas may be used as a basis for assigning sensitivity levels.

6. Other Factors. Consider any other information such as research or studies that includes indicators of visual sensitivity.

The third step of the VRM Visual Resource Inventory, subdivides landscapes into three distanced zones based on relative visibility from travel routes or observation points. The three zones are: foreground-middleground, background, and seldom seen. The foreground-middle ground (fm) zone includes areas seen from highways, rivers, or other viewing locations which are less than 3-5 miles (5-8 km) away. Seen areas beyond the foreground-middleground zone but usually less than 15 miles (24 km) away are in the background (bg) zone. Areas not seen as foreground-middleground or background (hidden from view) are in the seldom-seen (ss) zone.

3.8.2 SALEM SITE

The Salem site is characterized by a gently sloping landscape ranging from about 3,260 ft. MSL

to about 3,320 ft. (994 - 1,012 m) MSL. Off-site, this plateau-like landscape is incised by steep-sided coulees or gullies (e.g. Rogers Coulee just to the east of the project site) that cut into the land surface and range from a few feet deep to 100-200 feet (30-60 m) deep. These coulees run largely north-south and drain to Belt Creek to the northeast of the Salem site and the Missouri River to the northwest. The lands on the site itself and in the immediate vicinity are farmed (except for the coulees), with wheat being the dominant crop. The Highwood Mountains are prominently visible to the east at a distance of about 15 miles (24 km). Looking toward the south, the Little Belt Mountains that rise to over 9,000 ft. (2,740 m) MSL also are visible about 30-40 (48-64 km) miles away. Looking westward, the front range of the main Rocky Mountains also can be seen on clear days. Figures 3-42 to 3-44 are photographs from the site that illustrate some of its primary features.

Figure 3-42. Salem Site Looking South

Figure 3-43. Salem Site Looking North

Figure 3-44. Salem Site Looking East with Highwood Mountains Visible in Distance

Table 3-22 contains the scenic quality inventory for the Salem site.

Table 3-22. VRM Scenic Quality Inventory and Evaluation Chart for Salem Site

Key factors	Score
Landform	3
Vegetation	2
Water	0
Color	2
Influence of adjacent scenery	4
Scarcity	1
Cultural modifications	1
Overall score	**13**

Table 3-23 contains the sensitivity level analysis for the Salem site.

Table 3-23. VRM Sensitivity Level Analysis for Salem Site

Indicators of public concern	Sensitivity level
Type of users	Low
Amount of use	Low
Public interest	High
Adjacent land uses	Low
Special areas	High
Other factors	Medium
Overall rating	**Medium**

The next evaluation step of VRM's visual resource inventory for the Salem site is assigning a distance zone. The three zones are foreground-middleground, background, and seldom seen. The Salem site primarily would be foreground-middleground; this zone includes areas seen from highways, rivers, or other viewing locations less than 3-5 miles (5-8 km) away.

Based on these three evaluations, the visual resource inventory would assign the landscape at the Salem site a ranking of Class III, that is, as possessing moderate visual or scenic values.

3.8.3 INDUSTRIAL PARK SITE

The Industrial Park site is characterized by a generally flat landscape at approximately 3,500 ft. (1,070 m) MSL. It appears to have been cultivated at some time in the past but currently is vegetated with a mixture of native and non-native grasses and forbs. Immediately off-site are views of the International Malting Company (IMC) malt plant, trailers, towers, transmission lines, and one or more new suburban subdivisions. When air quality and visibility are good and views are not impeded by fugitive dust or smoke from wildland fires, the Highwood Mountains to the east, Little Belt Mountains to the south, and Rocky Mountains to the west are visible in the distance. Figures 3-45 to 3-47 are photographs from the Industrial Park site that illustrate some of its primary visual features.

Figure 3-45. Industrial Park Site Looking Northeast toward IMC Malt Plant

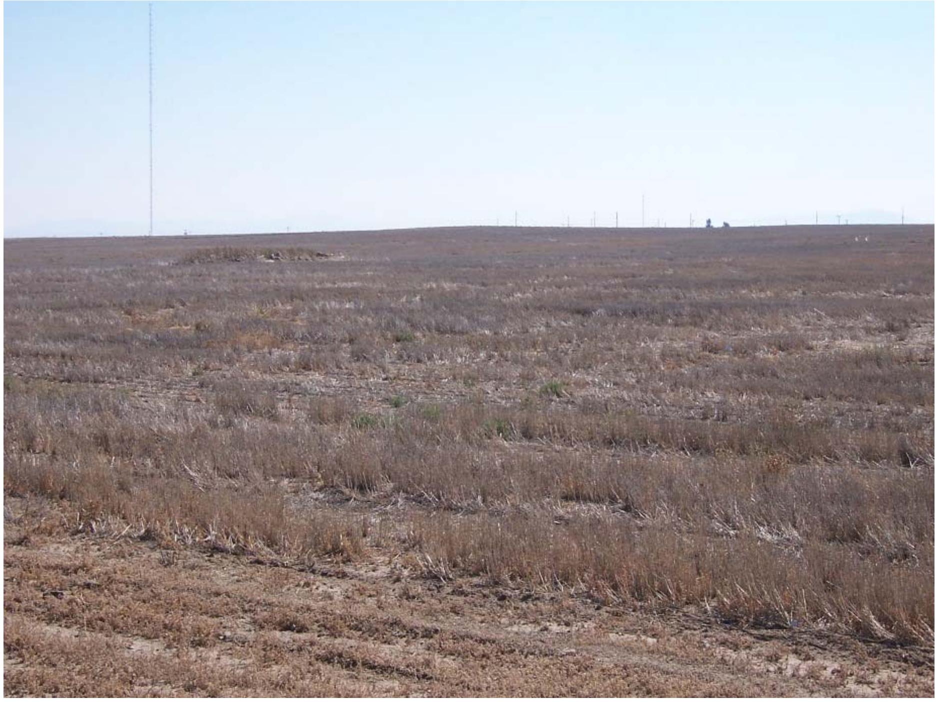


Figure 3-46. Industrial Park Site Looking Southeast toward Great Falls

Figure 3-47. Industrial Park Site Looking North

Table 3-24 contains the scenic quality inventory for the Industrial Park site.

Table 3-24. VRM Scenic Quality Inventory and Evaluation Chart for Industrial Park Site

Key factors	Score
Landform	1
Vegetation	1
Water	0
Color	1
Influence of adjacent scenery	1
Scarcity	1
Cultural modifications	-1
Overall score	**4**

Table 3-25 contains the sensitivity level analysis for the Industrial Park site.

Table 3-25. VRM Sensitivity Level Analysis for Industrial Park Site

Indicators of public concern	Sensitivity level
Type of users	Low
Amount of use	Low
Public interest	Low
Adjacent land uses	Low
Special areas	Low
Other factors	Low
Overall rating	**Low**

The next evaluation step of VRM's visual resource inventory for the Industrial Park site is assigning a distance zone. The Industrial Park site would primarily be foreground-middleground; this zone includes areas seen from highways, rivers, or other viewing locations less than 3-5 miles (5-8 km) away.

Based on these three evaluations, the visual resource inventory would assign the landscape at the Industrial Park site a ranking of Class IV, that is, as having scenic resources of least value.

3.8.4 TRANSMISSION LINE INTERCONNECTION CORRIDORS

Under each site alternative, transmission line interconnections would be developed to connect the HGS to the existing regional electricity transmission grid. From the Salem site, two corridors have been proposed for 230-kV interconnections: the first would be 4.1 miles (6.6 km) long and

would connect to the grid at the Great Falls-Broadview Tap Switchyard east of Great Falls (west-southwest of the Salem site); the second would be approximately 9.2 miles (23.8 km) long and run almost due west to connect with the grid at the Great Falls Switchyard. This latter would span the Missouri River just downstream of Cochrane Dam.

No specific corridors for the alternative Industrial Park site have been delineated on maps, but one route likely would run 1-2 miles (1.6-3.2 km) east to connect with the grid at the Great Falls Switchyard.

As shown in the photographs (Figures 3-48 and 3-49), there are no large, conspicuous existing power transmission lines in the immediate vicinity of the Salem site. However, there are a number of existing 230-kV power lines in the vicinity of and crossing the Missouri River and connecting into the Great Falls Switchyard (Figures 3-50 to 3-52). About 5-6 other transmission lines already span the river between Rainbow and Morony Dams. This is due primarily to the presence of the five PPL Montana Great Falls hydropower plants.

Figure 3-48. Typical Landscape West of Salem Site

Figure 3-49. Representative Habitat and Landscape Along Proposed Route of Both Transmission Lines Near Salem Site

Figure 3-50. Missouri River Downstream of Rainbow Falls; Existing 230 kV Transmission Lines Visible Approaching and Spanning River

Figure 3-51. 230 kV Transmission Lines Prominent Element in Scenery North of Missouri River and East of Great Falls Switchyard

Figure 3-52. Great Falls Switchyard from Lewis and Clark National Historic Trail Interpretive Center Parking Lot

3.9 TRANSPORTATION

3.9.1 ROADS AND TRAFFIC

Roadway evaluations focus on capacity, which reflects the ability of the road network to serve the traffic demand and volume. The capacity of a roadway depends mainly on the street width, number of lanes, intersection control, and other physical factors such as terrain and geometry. Traffic volumes typically are reported, depending on the project and database available, as the daily number of vehicular movements (e.g., passenger vehicles, buses, and trucks) in both directions on a segment of roadway, averaged over a full calendar year (average annual daily traffic (AADT)), or averaged over a period less than a year (average daily traffic (ADT)), and the number of vehicular movements on a road segment during the evening (p.m.) peak hour. These values are useful indicators in determining the extent to which the roadway segment is used and in assessing the potential for congestion and other problems.

The performance of a roadway segment is generally expressed in terms of the Level-of-Service (LOS). The LOS scale ranges from A to F, with each level defined by a range of volume to capacity ratios. LOS criteria A, B, and C are considered good operating conditions, where motorists experience minor to tolerable delays. LOS criterion D represents below average conditions. LOS criterion E corresponds to the maximum capacity of the roadway. LOS criterion F represents a gridlock situation. Table 3-26 presents the LOS designations for several types of two-lane highway segments (level terrain, rolling terrain, and mountainous terrain) and

their associated volume to capacity ratios. These levels are based on the Highway Capacity Manual of the Transportation Research Board of the National Research Council of the National Academies of Science and Engineering (TRB, 1994).

Table 3-26. Level-of-Service for General Two-lane Highway Segments

			Criteria (Volume/Capacity)		
LOS	Description	**% Time Delay**	Level terrain	Rolling terrain	Mountainous terrain
A	Free flow with users unaffected by the presence of other users of the roadway.	≤ 30	0.04-0.15	0.03-0.15	0.01-0.14
B	Stable flow, but presence of the users in traffic stream becomes noticeable.	≤ 45	0.16-0.27	0.13-0.26	0.10-0.25
C	Stable flow, but operation of single users becomes affected by interactions with others in traffic stream.	≤ 60	0.32-0.43	0.28-0.42	0.16-0.39
D	High density, but stable flow; speed and freedom of movement are severely restricted; poor levels of comfort and convenience.	≤ 75	0.57-0.64	0.43-0.62	0.33-0.58
E	Unstable flow; operating conditions at capacity with reduced speeds, maneuvering difficulty, and extremely poor levels of comfort and convenience.	> 75	1.00-1.00	0.90-0.97	0.78-0.91
F	Forced or breakdown flow with traffic demand exceeding capacity; unstable stop and go traffic.	100	>1.00	>1.00	>1.00

Source: TRB, 1994

In this table, the volume to capacity ratio is the ratio of the flow rate to an ideal capacity of 2,800 persons per hour in both directions.

The HGS Salem site is located beside the Salem Road (Figure 3-53), north of the Highwood Road, in the northwestern part of Cascade County. The portion of the county-maintained Salem Road (designated L07-204 by the MDT) in Cascade County is 6.5 miles (10.5 km) long. On the east side of Belt Creek, it crosses into Chouteau County. It is an unpaved, graded, gravel road (MDT, 2001b). Salem Road is a lightly traveled, local, rural road used primarily by farmers and rural residents in the area. On an average 24-hour day, in its southern segment near Highwood Road, it is traveled 36 times – counting vehicles making trips in both directions. That is, its ADT is 36. In the north segment of Salem Road in Cascade County, toward the proposed HGS (Salem) site, its ADT is 21 (Peterson, 2005).

The Highwood Road – Secondary Highway 228 – (S-228) is a paved, two-lane, state secondary road on the Montana Secondary Highway System several miles south of the Salem site that would be used to access it from Great Falls both during construction and once it was placed in operation. The nearest ADT measurement taken by MDT is about seven miles (11 km) from its intersection with the Salem Road. The combined (both directions) ADT in 2004 was 549 (Combs, 2005).

Figure 3-53. Salem Road Looking South near HGS Site

The Industrial Park site is located just east of U.S. Route 87, north of Great Falls near Black Eagle, MT. In the immediate vicinity of the Industrial Park site, U.S. 87 is a paved, undivided, two-lane principal arterial on the National Highway System. MDT has collected ADTs at two locations along U.S. 87 in the general vicinity of the Industrial Park site. At the intersection of North River Road and U.S. 87, just across the Missouri River, south of the exit to the Industrial Park site, the combined ADT on 4-lane U.S. 87 is 7,718. The 2005 ADT on the 4-lane section of US 87/89 is 4528. North of this and the exit to the Industrial Park site, at the intersection of U.S. 87 and 25th Avenue NE, the combined ADT on U.S. 87 is 4,280 (Combs, 2005).

The LOS of any given road segment can vary by time of day, especially during peak travel periods, which, around cities and towns, typically are morning and evening "rush hours," when many commuters head to and from their workplaces. During peak periods, the LOS is often lower than at other times, reflecting some degree of traffic congestion. Hourly traffic counts would be necessary to complete a thorough analysis of LOS on roads approaching the two alternative power plant sites. However, they are not available in the present instance (Combs, 2006), and in the absence of these counts, LOS can be approximated by making a reasonable assumption as to the percentage of total ADT that occurs in peak hour periods.

With respect to the proposed Salem site, the ADTs for both S-228 and the Salem Road are so low (549 for S-228 and 36 and 21 for the Salem Road, respectively) that it can be safely assumed that both roads operate at LOS A over the entire day.

With respect to the alternate Industrial Park site, assuming conservatively that 50 percent of the ADT for U.S.87 occurs during four hours of peak traffic flow, this would mean 970 vehicles per hour going both directions pass the intersection of U.S. 87 and North River Road, or about 16 vehicles per minute, which is eight vehicles per minute per direction. The Highway Capacity Manual of the Transportation Research Board of the National Research Council rates this flow rate as between LOS B and LOS C. At all other times, U.S. 87 would have a LOS A. Thus, U.S. 87 generally would be considered to have good operating conditions, with motorists experiencing minor to tolerable delays.

3.9.2 AIRPORTS

Great Falls International Airport is located at an elevation of 3,677 ft. (1,121 m) MSL, three miles (five kilometers) southwest of downtown Great Falls and on the opposite side of the Missouri River (GFIAA, 2005). It is situated about four miles southwest of the Salem Industrial site and 12-13 miles (19-21 km) from the Salem site for the HGS. The airport has a 10,500-ft. (3,200-m) runway, a 24-hr. tower, and the services, communications, and facilities characteristic of a modern, international airport.

Enplanements (passenger boardings) at Great Falls International Airport have risen gradually from 122,887 in 1989 to 141,833 in 2000, for an average of about 390 passengers boardings per day in 2000 (GFIAA, 2002). The airport averages 120 aircraft operations daily. Twenty-four percent of these operations are commercial, 24 percent transient general aviation, 23 percent air taxi, 15 percent local general aviation, and 14 percent military (GFIAA, 2005).

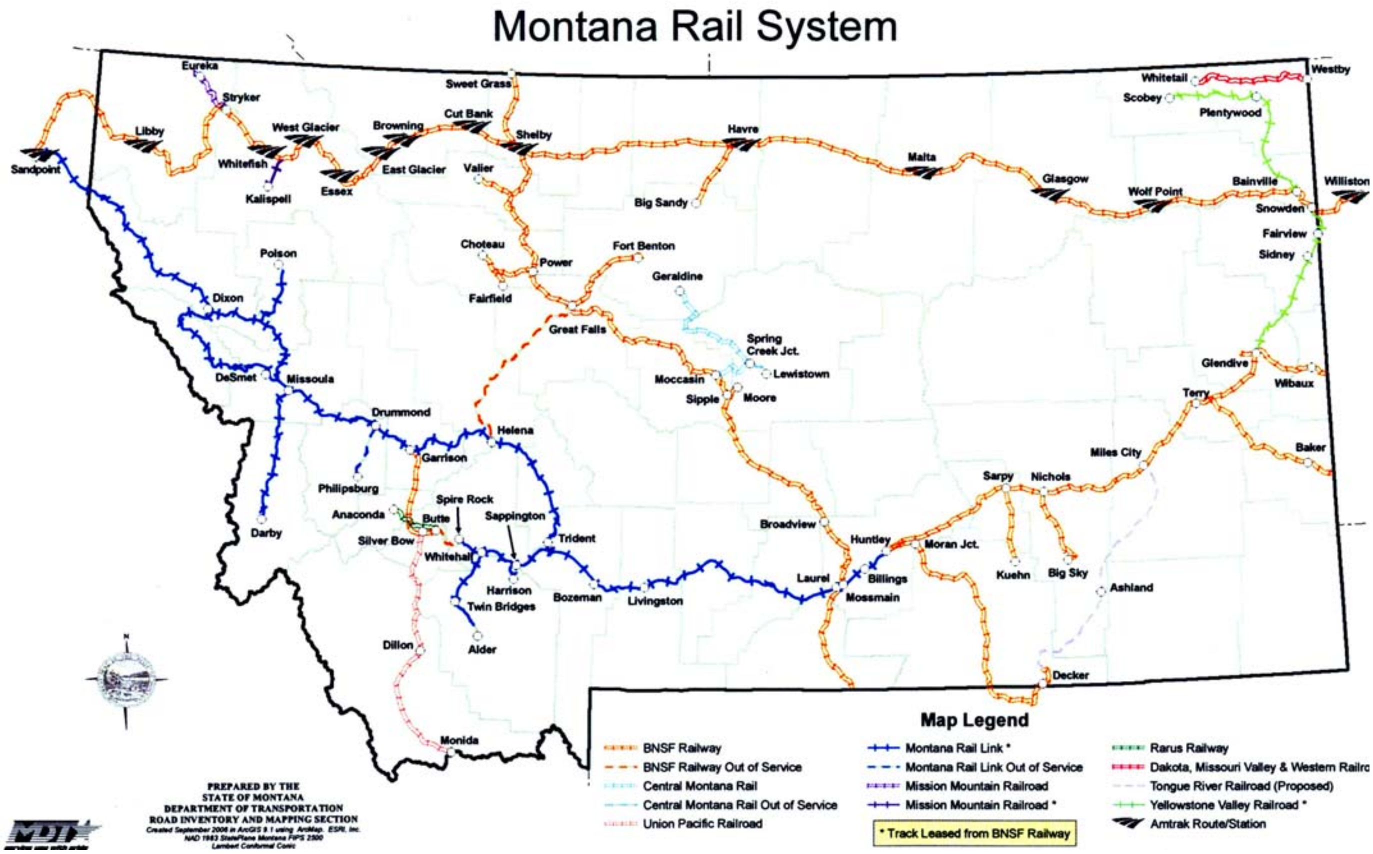
The present international airport site was recommended to the City of Great Falls in 1928 by the U.S. Department of Commerce as an excellent site for a future airport. In 1928, the City acquired 640 acres (260 ha) of land and construction was started on the first runway, which was completed in June 1929. By 1939 the airport's facilities included four runways, a large hangar, and an administration building. In 1941, the Civil Aeronautics Authority provided money for the further development of the Great Falls Municipal Airport, which was then known as Gore Field.

During World War II the airport was leased by the U.S. War Department and used as a base for the 7th Ferrying Command. During the war years, more than 7,500 bombers and fighter aircraft passed through Great Falls on their way to the war fronts in Europe and the Pacific. While using the airport as an airbase, the U.S. Army acquired an additional 740 acres (300 ha) of land and built many buildings and other facilities. In 1975, the terminal at Great Falls International Airport was replaced and all runways, aprons, and taxiways updated. With the use of Federal Aviation Administration (FAA) matching funds, the Airport Authority performs annual operations, maintenance, and capital improvements.

3.9.3 RAIL

A BNSF Railway line is located approximately six miles (10 km) south of the Salem location. (This is the railway to which the HGS proposes to build a rail spur.) Another BNSF railway passes within two miles of the Industrial Park site (MDT, 2001b). BNSF is one of the largest freight railroad operators in the United States, with 38,000 employees operating 5,675 locomotives and an average of 220,000 freight cars on a 32,000-mile (51,500-km) route system. More than 10 percent of the electricity produced in the U.S. is generated from coal hauled by BNSF, of which more than 90 percent comes from Wyoming and Montana's Powder River Basin (PRB), the world's largest single deposit of low-sulfur coal (BNSF, 2005). Figure 3-54 is a map of railroad routes in Montana.

Figure 3-54. Railroad Routes in Montana



3.10 FARMLAND AND LAND USE

3.10.1 FARMLAND

The total farmland in both Montana and Cascade County has generally decreased slightly in recent decades, while the size of the average farm unit has increased. The average size of a farm throughout the State of Montana is 2,139 acres (866 ha), while the average size of a farm in Cascade County is 1,339 acres (542 ha) (USDA, 2003). Farmland occupies approximately 70 percent of the state's total land area. Specifically, in 2002, cropland occupied 19 percent of Montana's land area, while rangeland and pasture accounted for another 51 percent (USDA, 2003).

In Cascade County, just over 80 percent of all land, or 1,388,530 acres (561,198 ha), is farmland. Of this land, 507,107 acres (205,220 ha) is in cropland, with 41,901 acres (16,957 ha) irrigated. The remaining farmland (881,423 acres or 356,700 ha) is rangeland and pasture. Nearly all the undeveloped land surrounding the proposed sites is used for cultivation, with the primary agricultural crop being winter wheat, followed by spring wheat and barley (USDA, 2003).

Figure 3-55. Typical Agricultural Land Use near Proposed Sites

The Farmland Protection Policy Act (FPPA) is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural uses. It assures that, to the extent possible, federal programs are administered to be compatible with state, local, and private programs and policies to protect farmland.

For the purpose of FPPA, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can be forest land, pastureland, cropland, or other land, but not water-covered or urban built-up land.

Prime Farmland

As defined by the U.S. Department of Agriculture, this is the land with soils that possess the best combination of physical and chemical characteristics for sustainable production of food, feed, forage, fiber and oilseed crops, as well as being available for these uses.

Prime farmland may presently be under cultivation, pasture, or forest, but it may not be urban or built-up land. The soil qualities, growing season and water supply are those needed for sustained high-yield production of crops when proper management is applied.

Farmland of Statewide Importance

This is unique farmland that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable.

The Salem site is located entirely on Pendroy Clay soils. Pendroy Clays typically are used for dryland crops as well as rangeland, and are not listed as prime or any other important farmlands in the Cascade County soil survey (NRCS, 2004). The land evaluation productivity index for Pendroy Clays for the state Land Evaluation and Site Assessment (LESA) system is 46 of 100 (NRCS, 2002). A rating under 50 generally means that the soil is of marginal quality for agricultural uses, and that approximately 73 percent of soils ranked have a higher quality (NRCS, 2002).

Rangeland productivity measures the amount of vegetation that can be expected to grow annually on well-managed rangeland that is supporting the potential natural community. In a normal year, the average total dry-weight production of rangeland vegetation on Pendroy Clay soils is 1,300 pounds/acre, which is slightly less than the average rangeland vegetation productivity of soils in Cascade County (NRCS, 2004).

Pendroy Clay soils are in land capability class 4e, which consists of soils that have very severe limitations that restrict the choice of plants or require careful management, or both. The limitations of the Pendroy Clays primarily are due to their susceptibility to erosion (NRCS, no date).

The majority of the Industrial Park site is located on Ethridge-Kobase silty clay loams, with a small amount of associated facilities towards the southwest located on Linnet-Acel silty clay loams, and Kobase and Lothair silty clay loams towards the southeast.

LESA

The Natural Resources Conservation Service (NRCS) in Montana adopted a Statewide Land Evaluation and Site Assessment (LESA) System on June 20, 2003. The Statewide LESA System is used to rank and prioritize proposals for the Farm and Ranch Lands Protection Program (FRPP), and to systematically assess and identify prime agricultural lands through the use of a consistent rating scheme.

Factors are used to label a group of attributes such as soil potential, agricultural productivity, or environmental benefit. Factor scale refers to the way points are assigned to a factor, i.e. 0 to 100 points. A factor rating is the value assigned to a particular parcel. Weight refers to the relative importance of the factor in the LESA system, i.e. a multiplier applied to a factor rating (for example, 0.0 to 1.0). Score is used to denote the total of all weighted factor ratings, i.e. a LESA score.

Ethridge-Kobase and Kobase soils are used primarily for non-irrigated crops and for range, though occasionally they are used for irrigated cropland. Ethridge-Kobase soils are listed as prime farmland if they are irrigated (NRCS, 2004). The land evaluation productivity index for Ethridge-Kobase soils for the Montana State LESA system is 64 of 100 (NRCS, 2002). A rating between 50 and 75 generally indicates that the soil is of relatively good quality for agricultural uses, and that approximately 43 percent of soils ranked have a higher quality (NRCS, 2002).

Linnet-Acel soils are used mainly for non-irrigated cropland and rangeland; they are listed as farmland of statewide importance (NRCS, 2004). The land evaluation productivity index for Linnet-Acel soils for the state LESA system is 62 of 100 (NRCS, 2002), also indicating that soils are of good quality for agricultural uses.

Lothair soils are used mainly for rangeland, and are not listed as prime or any other important farmland. They have a LESA land evaluation productivity index of 46 out of 100, which generally indicates that the soil is of marginal quality for agricultural uses.

In a normal year, the average total dry-weight production of rangeland vegetation is 1,400 pounds/acre on Ethridge-Kobase soils, and 1,200 pounds/acre on Linnet-Acel and Lothair soils, which are average to slightly less than the average rangeland vegetation productivity values for soils in Cascade County (NRCS, 2004).

Ethridge-Kobase and Linnet-Acel soils all are in land capability class 3e, which consists of soils that have severe limitations that reduce the choice of plants or require careful management, or both. The limitations of these soils primarily are due to their susceptibility to erosion (NRCS, no date).

3.10.2 ZONING

CEQ regulations for implementing NEPA and MEPA require agencies to consider the consistency of a proposed action with approved state and local plans and laws, including all local ordinances and zoning policies.

In the late 1970's, the Cascade County Development Plan was adopted by the Cascade County Commissioners. The development plan labeled all land within Cascade County, that was not part of an incorporated city or town, city-county jurisdictional area, or other created zoning district, as residential/agricultural zoned land. Both the preferred location, the Salem site, and the alternative site, the Industrial site, are located entirely within Cascade County on unincorporated county land, and are thus subject to the County's zoning and permitting requirements (Clifton, 2005).

Land located within incorporated areas of the City of Great Falls is under city jurisdiction. All of the land in the City of Great Falls is zoned and subject to land development regulations. The Planning Advisory Board is designated as the City Zoning Commission. In that capacity, the Board reviews rezoning and conditional use petitions, holds public hearings, and makes recommendations to the City Commission. The Current Planning Section of the city has jurisdiction over zoning and permitting requirements and reviews land annexation applications. City building permits, safety inspection certificates, floodplain permits, design review, and zoning enforcement are the responsibility of the Community Development Department.

3.10.3 SALEM SITE

The Salem site is unincorporated county land that is zoned for agricultural uses (Clifton, 2005). This site lies eight miles (13 km) to the east of Great Falls and is currently used for dryland farming of wheat. The site is located east of the intersection between Salem Road and an abandoned railroad bed previously used by the Milwaukee, St. Paul, and Pacific railroads as a grain drop off/pick up location. The historical use

Figure 3-56. Farmstead Northwest of Proposed Salem Site

of the area has been limited to agricultural and open space activities. Though the site is currently unoccupied, there is a small abandoned building present on the site adjacent to the former railroad bed, which is most likely related to past agricultural activities.

Two single family residencies, or farmsteads, are located approximately one-half mile (0.8 km) from and adjacent to the proposed site, to the northwest and to the southwest, respectively. The raw water intake pipeline extending from the Missouri River to the proposed plant would be located immediately north of the Urquhart residence situated to the northwest (Figure 3-54).

The farmstead located to the southwest of the proposed facility is currently unoccupied. A railroad spur line within the Salem Road corridor would be constructed immediately adjacent to this farmstead and fresh- and waste-water pipelines would be buried just west of the property.

3.10.4 Industrial Park Site

The Industrial Park site remains unincorporated county land, and it is zoned for Agriculture uses by Cascade County (Clifton, 2005). The site has historically been used strictly for agricultural or open space uses. The site itself is currently undeveloped open space, and there are no existing structures on site. However, the site is located adjacent to a functioning industrial park which houses several small businesses and industries. A malting plant currently is under construction by International Malting Company (IMC) approximately one-half mile (0.8 km) southwest of the proposed Industrial site location, and is expected to be completed in the near future. The malting plant is located on previously unincorporated land which has subsequently been annexed into the City of Great Falls (Clifton, 2006). Additionally, several established and developing residential areas are located one half-mile to a mile (0.8-1.6 km) west south-west of the proposed site.

3.11 Waste Management

Under the Montana solid waste management laws (75-10-101 *et seq.* and 75-10-201 *et seq.*, MCA), licenses are required from DEQ for the disposal of solid waste and the operation of a solid waste management system in Montana.

Most municipal, commercial, and industrial solid waste, including construction debris, generated within Cascade County and disposed of off-site is delivered to the High Plains Sanitary Landfill and Recycle Center (HPSL) by either the City of Great Falls or Montana Waste Systems. The HPSL is regulated by rules adopted by DEQ in ARM 17.50.501 *et seq.*, 17.50.701 *et seq.*, and 17.50.410, 411, 415, and 416., which take the same general approach as the EPA's Criteria for Municipal Solid Waste Landfills found at 40 CRF Part 258. The landfill is exempt from liner and groundwater monitoring requirements under a waiver received from the DEQ. The waiver is based on the No Migration Demonstration approved by the DEQ based on site geology and hydrology. The HPSL is licensed under Montana Solid Waste License #225 and is owned and operated by Montana Waste Systems of Great Falls. The HPSL is located within Cascade County, approximately nine miles (14 km) north of the City of Great Falls and one mile (1.6 km) east of US Route 87. The landfill receives approximately 150,000 tons of refuse annually, or

about 410 tons per day and has extensive capacity remaining (HPSL, 2006).

There are four other smaller private landfills in the Great Falls area. Three are Class III landfills that receive inert waste such as concrete rubble, and one Class IV landfill that receives mixed construction and demolition waste. These landfills primarily serve the landfill owners, all of whom are in the construction business, but occasionally take waste from outside parties. All are much smaller facilities. For example, the Shumaker Class IV landfill took in 7,505 tons of material in 2005, or 21 tons per day. The Shumaker landfill is located north of Malmstrom Air Force Base in the old railroad right-of-way. It is in the proposed water and wastewater corridor so the lines may have to be diverted slightly to the south at the landfill location.

Regulated hazardous waste cannot be accepted at the HPSL and must be delivered to a permitted hazardous waste destination, such as an incinerator or hazardous waste landfill, the nearest of which are located out of state in Oregon and Utah. A Class II landfill like the HPSL may receive household hazardous wastes or conditionally exempt small quantity generator hazardous waste.

3.12 HUMAN HEALTH AND SAFETY

3.12.1 CASCADE COUNTY AND THE CITY OF GREAT FALLS

The Cascade City-County Health Department is responsible for the prevention of disease, promotion of good health practices and protection of the environment within Cascade County and the City of Great Falls. The department administers 35 different programs in the areas of community and family, communicable disease prevention/control, health promotion/chronic disease prevention, environmental health, and public health. Additionally, the Health Department compiles and maintains statistics on the causes of mortality.

Between 1996-2000, the three leading causes of death in Cascade County were heart disease, cancer, and chronic lower respiratory disease (CLRD), while the three leading causes of death in the State of Montana were heart disease, cancer, and cerebrovascular disease (Table 3-27). The cancer incidence rate of Cascade County was slightly elevated (506.8 diagnoses per 100,000 people) compared to the overall rate of cancer in the State of Montana (443.6 diagnoses per 100,000 people) (CCCHD, 2002).

A State-funded environmental public health tracking project contracted with the Cascade City-County Health Department to identify and assess the environmental health concerns of populations within the county in 2003 and 2004 (EPHT, 2004). Of the 1,500 randomly selected households asked to participate in the study, 280 households returned useable survey responses. These survey results are summarized in Figure 3-57.

There are two National Priorities List (NPL) sites located within Cascade County: the Carpenter-Snow Creek and Barker-Hughesville sites (EPA, 2005d). The NPL is the list of national priorities among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the United States and its territories, and the sites listed in the NPL

Top 10 Environmental Health Issues of Concern to CASCADE COUNTY

1.	West Nile Virus	6.	Leaking Underground Storage Tanks
2.	Hantavirus	7.	Secondhand Smoke
3.	Pesticides	8.	Mining Runoff
4.	Herbicides	9.	Hazardous Waste Disposal
5.	Oil Refining	10.	Nuisance Properties

Top 10 Environmental Health Issues of Concern to FAMILIY/HOUSEHOLD

1.	West Nile Virus	6.	Oil Refining
2.	Hantavirus	7.	Pollens
3.	Dust & particulates	8.	Herbicides
4.	Carbon Monoxide from cars	9.	Restaurant Food Practices
5.	Secondhand Smoke	10.	Pesticides

Figure 3-57. Environmental Health Concerns
Source: EPHT, 2004

also are known as Superfund sites. In 2003, the Agency for Toxic Substances and Disease Registry (ATSDR), classified both sites as public health hazards.

The Carpenter-Snow Creek site is located near the town of Neihart in the Little Belt Mountains southeast of Great Falls. The site is in an historic mining district, and due to the impact of mining activities, groundwater, soils and some streams are contaminated with heavy metals and arsenic. Approximately 96 abandoned mines have been identified in the Carpenter-Snow Creek Mining District, and at least 21 of these have been identified as probable sources of contamination to surface water. There are documented impacts from mining waste to soil, surface water and stream sediments in Carpenter Creek, Snow Creek, and Belt Creek.

In 2002 and 2003, EPA collected soil/mine waste, surface water sediment and groundwater samples in the town of Neihart (Neihart Operable Unit). Concentrations of lead and arsenic were above screening levels in some residential yards and alleys. Contaminant levels in the surface water of Belt Creek as it flows through Neihart were not above drinking water standards or levels that EPA considers unhealthy for aquatic life. Contaminant levels in the sediment of Belt Creek as it flows through Neihart did not exceed levels considered safe for recreational use.

Results from two groundwater samples indicated that none of the metals were present at levels above the human health drinking water standards. In 2004, EPA conducted a cleanup of lead-contaminated soils near two historic mills within Neihart. The Neihart tailings pile along Belt Creek was capped and armored to prevent runoff or failure in floods. EPA has sampled residential soils throughout Neihart. A human health risk assessment and draft feasibility study for Neihart were completed in 2005.

The Barker-Hughesville (BH) District site is located in both Cascade and Judith Basin Counties, in the Little Belt Mountains southeast of Great Falls. The site is in an historic mining district and due to the impacts of mining activities, area groundwater, soils and surface water are now contaminated with heavy metals and arsenic. Dissolved zinc is the metal of greatest concern. Because of the contamination and risks to public health and the environment, EPA proposed the

Table 3-27. Cascade County Health Profile

Source: CCCHD, 2002

HEALTH STATUS INDICATORS	Cascade		Montana	
Fertility Rates[4] (**teen** births per 1,000 teen females; **all** births per 1,000 females of childbearing age)	Teen	All Women	Teen	All Women
	48.4 (n=693)	65.9 (n=5,418)	36.9 (n=6,460)	58.8 (n=53,995)
Prenatal Care (percent beginning care in the first trimester; percent receiving adequate, i.e., early and continuous prenatal care)[4]	1st Trimester	Adequacy	1st Trimester	Adequacy
	88.2%	62.8%	82.5%	72.6%
Percent Low Birthweight[4] (below 5 lbs. 8 oz.)	6.5%		6.5%	
Infant Mortality (deaths per 1,000 live births)[4]	8.7		6.7	
Cancer Incidence Rate (diagnoses per 100,000 population)[5]	506.8 (95% C.I. ±21.6)		443.6 (95% C.I. ±6.1)	
Leading Causes of Death[4]	1. HEART DISEASE 2. CANCER 3. CLRD		1. HEART DISEASE 2. CANCER 3. CEREBROVASCULAR DISEASE	
Heart Disease Death Rate (per 100,000 population)[4]	231.4 (n=937)		229.4 (n=10,248)	
Motor Vehicle Accident Death Rate (per 100,000 population)[4]	16.5 (n=67)		23.3 (n=1,043)	
Suicide Rate (per 100,000 population)[4]	21.5 (n=87)		18.5 (n=827)	
Traumatic Injury Death Rate (per 100,000 population)[4]	65.9 (n=267)		63.7 (n=2,847)	
Percent of Motor Vehicle Crashes Involving Alcohol	6.3% (n=783)		9.5% (n=10,688)	
Percent of the Medicaid Population Receiving Mental Health Services (FY2001)	24.0%		19.6%	
Percent of 2-yr. Olds Seen by a Health Care Provider that are Fully Immunized (2001)	78% (n=32)		92% (n=1,965)	
STD Incidence (reported cases per 100,000)	225.2 (n=912)		160.9 (n=7,191)	

HEALTH RESOURCE ASSESSMENT, 2002	Cascade				Montana			
Local Hospitals, Critical Access Hospitals (CAH), and Total Number of Beds	Local Hospitals		CAH	# beds	Local Hospitals		CAH	# beds
	2 local		0	395	36 local; 2 child/ adult psych; 1 VA		27	2,937
Rural Health Clinics, Federally Qualified Health Centers, IHS and Tribal Health Facilities (number)	RHCs	FQHCs	IHS & Tribal		RHCs	FQHCs	IHS & Tribal	
	0	2	0		36	14	17	
Availability of Basic and Enhanced 9-1-1 Services	Basic + Enhanced				Basic-all counties; Enhanced-16 counties			
Availability of Emergency Medical Services:	#	Cascade County Locations						
Basic Life Support Services	3	Belt, Great Falls						
Advanced Life Support Services	8	Great Falls						
Nursing Homes (number of facilities and beds)	3 (647 beds)				105 (7,733 beds)			
Aging Services: number of Personal Care Home [PC], Adult Foster Care [AFC], and Adult Day Care [ADC] Licenses	PC (# beds)		AFC	ADC	PC (# beds)		AFC	ADC
	15 (431)		5	2	147 (3,173)		106	64
Home Care Services: number of Home Health Agency [HHA] and Hospice Licenses	HHA		Hospice		HHA		Hospice	
	2		1		51		30	
Public Health Resources: number of full-time equivalent Public Health Nurses [PHN], Registered Sanitarians [RS], Registered Dietitians [RD], and Health Educators [HlthEd]	PHN	RS	RD	HlthEd	PHN	RS	RD	HlthEd
	7.6	5.5	0	3	116.1	81.5	14.4	26.9
Primary Care Provider Resources: number of doctors [MDs and DOs], Nurse Midwives [NMW], Nurse Practitioners [NP], and Physician's Assistants [PA-C]	MD/DO	NMW	NP	PA-C	MD/DO	NMW	NP	PA-C
	96	3	26	13	1,060	31	298	210
Dental Resources: Dentists and Dental Hygienists	52 dentists		28 hygienists		477 dentists		391 hygienists	
Health Care Provider Shortage Status:	Federal HPSA: None							
Health Professional Shortage Areas [HPSA]	Mental Health HPSA: No				Dental HPSA: Medicaid population			
Medically Underserved Areas or Populations [MUA/MUP]	MUA/MUP: Cascade CCD & CT/BNAs 3,4,5,6,7,8,9,16,104							

4 1996-2000, Office of Vital Statistics.

5 1996-2000 average, age-adjusted to 2000 standard-million population, Montana Central Tumor Registry, DPHHS.

* Non-transporting

site for the NPL for Superfund clean up in December 2000. On September 13, 2001, the site was listed as a final NPL site in the *Federal Register*.

There are approximately 46 abandoned mines in the BH District. Sixteen have been identified as water contamination sources because of their proximity to surface streams. These abandoned mines and associated contamination are dispersed throughout a 6,000-acre (2,430 ha) watershed. Metals and arsenic contamination of soils, groundwater, and surface water have been documented in several studies conducted at the site since 1990. Ten discharging adits (horizontal mine openings) also have been identified. Cleanup on the sites is ongoing.

3.12.2 SALEM SITE AND INDUSTRIAL PARK SITE

On July 1, 2004, Phase I Environmental Site Assessments (ESAs) were completed on both the Salem and Industrial Sites in order to identify recognized environmental conditions (SME, 2004c). A recognized environmental condition (REC) is defined as the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property. The Phase I was completed in general accordance with procedures outlined in American Society for Testing and Materials (ASTM) E1527-00, Standard Practice of Environmental Assessments: Phase I ESA Process.

The ESAs included evaluation of individual properties adjacent to and within one mile (1.6 km) of the subject sites. The evaluation included assessment of historical information pertaining to the area including historic aerial photographs, historic topographic mapping, available fire insurance mapping, a review of regulatory records for the areas, and visual evaluation of the assessment areas. Historically, activities conducted within the assessment areas have been for agricultural purposes, much as they are today. There were no recognized environmental conditions or concerns identified during the site assessments at either the Salem site or the Industrial site (SME, 2004). However, the ESA at the Industrial site identified two Resource Conservation Recovery Information System (RCRIS) small quantity hazardous waste generators and a Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) – No Further Remedial Action site, within a ¾ mile (1.2 km) radius of the site. Additionally, the ESA identified one state hazardous waste site under the Montana Comprehensive Environmental Cleanup and Responsibility Act (CECRA) and one state leaking underground storage tank (LUST) within one mile (1.6 km) of the Industrial site.

3.13 SOCIOECONOMIC ENVIRONMENT

3.13.1 CASCADE COUNTY AND CITY OF GREAT FALLS – A BRIEF HISTORY

The preferred Salem site and the alternative Industrial Park site of the proposed HGS are located in Cascade County, MT. Both are also near the City of Great Falls, MT. The Salem site is approximately eight miles (13 km) to the east and the Industrial Park site a mile or two to the

north, on the northern edge of the city, within the city's designated Central Montana Agricultural and Technology Park.

The City of Great Falls was settled around the Missouri River, one of the most important rivers in the American West. The Missouri has the fourth-largest drainage basin of any river in North America (after the Mississippi, St. Lawrence, and Mackenzie) and the second greatest "virgin" (original) discharge of any river in the American West (after the Columbia) (Benke and Cushing, 2005). The Missouri provided the city with its name as well as its reason for being. As the river traverses the city it drops over 500 feet (150 m) in a series of rapids and five impressive waterfalls – the Great Falls of the Missouri River (CGF, no date).

Figure 3-58. Great Falls, Montana today

In June 1805, Merriwether Lewis and William Clark were the first known white explorers to catch sight of the "great falls" of the Missouri River. Since the Corps of Discovery was traveling by keelboat and canoe, this series of waterfalls presented a formidable obstacle to their advance. In fact, the Corps of Discovery took a month to portage all its gear and equipment upstream above the last falls, a mere 18 miles (29 km) away, using the portage route <u>south</u> of the river described in Section 3.9 (BSF, no date). By mid-July of 1805, the expedition had left the Great Falls behind and did not return. Except for the occasional trapper or mountain man passing through, the area remained undeveloped and uninhabited by Euro-Americans until the 1880's.

Entrepreneur Paris Gibson first arrived at Great Falls in 1880, and almost immediately began to plan a city at the location. Gibson selected this site because he recognized its potential as a transportation hub for nearby coal fields and other natural resources. From the beginning, Great Falls was a planned city, unlike other Montana and western boom-and-bust mining towns. Everything from straight streets, minimum width of streets and the location of parks was meticulously planned. Gibson and railroad magnate James Hill expended considerable effort in laying out and developing the city. Great Falls officially began settlement in1884 and by 1886 had more than 1,000 residents and numerous businesses. The railroad arrived one year later, allowing the agricultural potential of the area around Great Falls to be tapped. In 1888, a silver smelter was built along the Missouri River just outside of town (BSF, no date).

Shortly after the invention of electrical generators, Gibson, recognizing the huge potential for hydroelectric power from the falls on the Missouri River, built the first dam at Black Eagle Falls, just outside downtown. Other dams and hydropower plants followed, earning Great Falls the nickname of "The Electric City". Throughout the first half of the 20th century, Great Falls continued to grow steadily, unlike many boom-and-bust mining and cattle towns throughout the West. By the late 1950's, Great Falls was the largest city in Montana, with a population of 55,000 in the 1960 census (BSF, no date).

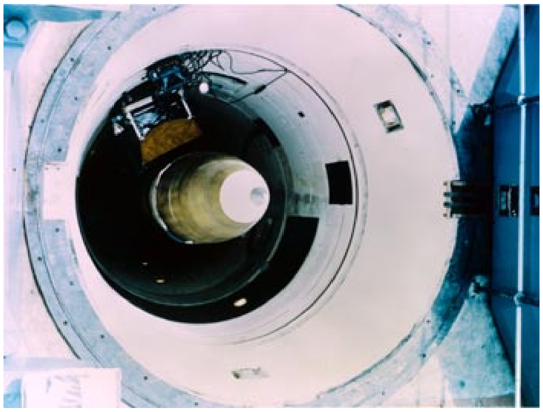


Figure 3-59. Minuteman III in its Silo

World War II facilitated this steady population growth. The city had appealed to the War Department for an Air Force Base (AFB) before World War II. With the onset of war, this airbase became a reality; known as East Base, it housed and trained bomber crews of the 2nd Air Force. East Base, located just east of Great Falls, was continuously expanded throughout the war and after it. The Strategic Air Command (SAC) took over the airbase in the 1950s and in 1959, the name of East Base was changed to Malmstrom AFB (Malmstrom or AFB). Starting in the late 1950s and continuing to the present, Malmstrom has housed a number of nuclear missile silos as an integral part of the nation's strategic defense system (BSF, no date). Malmstrom's 341st Space Wing controls 200 Intercontinental Ballistic Missiles (ICBMs), missiles tipped with nuclear warheads – originally Minuteman I and Minuteman II, now Minuteman III (Figure 3-57) – in underground silos scattered around nine central Montana counties (Anon., 2004). This missile complex is the largest in the Western Hemisphere. The 341st manages a variety of equipment, facilities, and vehicles worth more than $5 billion (MAFB, 2002).

With about 3,400 military personnel, the AFB contributes $134 million a year in payroll and direct spending in the Great Falls area. Adding in the indirect impact of Malmstrom on area businesses, the total economic impact of the base increases to about $284 million annually. The AFB accounts for 35 percent of the city's economic base. In addition to military employees and their 5,000 dependents, the MAFB also employs about 370 civilian workers, while another 1,270 civilians do at least some work involving Malmstrom under private contracts. The base also affects the Great Falls economy in less direct ways. Some 1,400 retired military people live in the Great Falls area, in part because of services available at the AFB. The 15,000 people with at least some connection to the AFB comprise more than 20 percent of Cascade County's population (Anon., 2004). City and state officials were relieved by the recent Department of Defense decision that Malmstrom AFB should be kept off the 2005 Base Realignment and Closure (BRAC) list (Baucus, 2005).

Figure 3-60. Cascade County Courthouse in Great Falls

During the 1970s and 1980s, the closure of many resource extraction businesses in Montana, the departure of several railroads, and the adjustments facing agriculture all combined to stifle the growth of Great Falls. By 1990, the city still had a population of about 55,000 people, though some growth had occurred outside of the city limits (BSF, no date).

In the 1990s certain new industries appeared in Great Falls, offsetting the disappearance of older manufacturing and resource extraction jobs. By the 2000 Census, the city had a population of 56,690 (USCB, 2005c), with additional population growth having occurred outside the official city limits.

Great Falls today still reflects the careful planning at the time of its creation in the 1880s. Virtually all streets are on a straight grid-pattern and the main streets in the downtown are wide and easy to navigate. Most streets are also tree-lined, which used to be unusual for western prairie towns. Numerous parks, especially along the Missouri River, are scattered throughout town. The changing nature of Montana's economy, from one based on raw materials extraction, manufacturing and agriculture to one based on tourism and services, has largely bypassed Great Falls (BSF, no date).

Great Falls has two colleges: the Great Falls campus of Montana State University (MSU) and the University of Great Falls. The MSU-Great Falls College of Technology provides about 2,000 students with a two-year educational curriculum that offers associate degrees and preparation for transfer to a four-year university (MSU-GF, 2004). The University of Great Falls is a private, Catholic university founded in 1932 (UGF, no date).

Great Falls is the seat of government for Cascade County. The county was created in 1887 out of four other counties two years before Montana became the 41st state (CC, no date). U.S. Census counts for Cascade County show its growth through the 20th century (Table 3-28).

Table 3-28. Cascade County Population Growth, 1900-2000

Year	Cascade County Population
1900	25,777
1910	28,833
1920	38,836
1930	41,146
1940	41,999
1950	53,027
1960	73,418
1970	81,804
1980	80,696
1990	77,691
2000	80,357

Source: USCB, 1995; USCB, 2005b

The decade of the 1950s, coinciding with the expansion of East Base/Malmstrom AFB, showed more population growth than any other in the century.

3.13.2 Cascade County and City of Great Falls – Demographic Data

The City of Great Falls is by far the largest settlement in Cascade County, which is predominantly a rural, low population density, agricultural county. Table 3-29 presents recent demographic and economic data on Montana, Cascade County, and the City of Great Falls from the U.S. Census Bureau.

Table 3-29. Socioeconomic Characteristics of State of Montana, Cascade County, and City of Great Falls

Characteristic	Montana	Cascade County	City of Great Falls
Population, 2004 estimate[1]	917,621	79,849	56,155
Population, % change, 2000-2004[2]	2.7%	-0.6%	-1.0%
Population, 2000	902,195	80,357	56,690
Population, % change, 1990-2000	12.9%	3.4%	2.4%
Land Area, 2000 (square miles)	145,552	2,698	19
Persons per square mile (population density), 2000	6	30	2,909
White persons, %, 2000	91%	91%	90%
Non-Hispanic white persons, %, 2000	90%	90%	NA[3]
Black or African American persons, %, 2000	0.3%	1%	1%
American Indian persons, %, 2000	6%	4%	5%
Asian persons, %, 2000	0.5%	0.8%	0.9%
Persons of Latino or Hispanic origin, %, 2000	2%	2%	2%
Language other than English spoken at home, %, 2000	5%	5%	5%
Foreign born persons, %, 2000	2%	2%	2%
High school graduates, % of persons age 25+, 2000	87%	87%	87%
Bachelor's degree or higher, % of persons 25+, 2000	24%	22%	22%
Persons with a disability, age 5+, 2000	145,732	13,958	NA[3]
Median household income, 1999	$33,024	$32,971	$32,436
Per capita money income, 1999	$17,151	$17,566	$18,059
Persons below poverty, %, 1999	15%	14%	15%

Sources: USCB, 2005a; USCB, 2005b; USCB, 2005c
[1]2003 estimate for City of Great Falls
[2]2000-2003 for City of Great Falls
[3]Not Available

Both the City of Great Falls and Cascade County have had relatively stable populations over the last four decades. Both the city and the county mirror the State of Montana's ethnic/racial composition, which has smaller percentages of ethnic and racial minorities than in the country as a whole. The city and county also reflect statewide averages in educational attainment, per capita and household income, and poverty rates. Thus they are relatively typical or representative of Montana.

3.13.3 Cascade County and City of Great Falls – Economic Data

Table 3-30 shows selected economic characteristics of Cascade County taken from the 2000 Census and broken down in three ways, by occupation, industry, and class of worker (USCB, 2000a).

Table 3-30. Profile of Selected Economic Characteristics, Cascade County, 2000

Subject	Number	%
Employed civilian population 16 years and over	**34,792**	**100.0**
OCCUPATION		
Management, professional, and related occupations	10,626	30.5
Service occupations	6,401	18.4
Sales and office occupations	10,324	29.7
Farming, fishing, and forestry occupations	331	1.0
Construction, extraction, and maintenance occupations	3,478	10.0
Production, transportation, and material moving occupations	3,632	10.4
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	1,028	3.0
Construction	2,650	7.6
Manufacturing	1,212	3.5
Wholesale trade	1,289	3.7
Retail trade	4,925	14.2
Transportation and warehousing, and utilities	1,954	5.6
Information	832	2.4
Finance, insurance, real estate, and rental and leasing	2,579	7.4
Professional, scientific, management, administrative, and waste management services	2,259	6.5
Educational, health and social services	8,297	23.8
Arts, entertainment, recreation, accommodation and food services	3,454	9.9
Other services (except public administration)	1,894	5.4
Public administration	2,419	7.0
CLASS OF WORKER		
Private wage and salary workers	25,403	73.0
Government workers	5,949	17.1
Self-employed workers in own not incorporated business	3,256	9.4
Unpaid family workers	184	0.5

Source: USCB, 2000a

The City of Great Falls, with more than 70 percent of the population of Cascade County, dominates the employment statistics. Hence, among the county's occupations, "management, professional, and related operations" and "sales and office" workers outnumber those engaged in "farming, fishing, and forestry operations" more than 60:1, even though Cascade County has 94 times more rural and agricultural land than urbanized land (USCB, 2003). Table 3-31 lists the major employers in Great Falls.

Table 3-31. Major Employers in Great Falls

Company	# of Employees
Malmstrom Air Force Base	4572
Benefis Healthcare Center	2044
Great Falls Public Schools	1417
Montana Air National Guard	979
Great Falls Clinic	663
National Electronics Warranty (N.E.W.)	600
Cascade County	500
City of Great Falls	480
Wal-Mart	480
Sletten Construction Co.	375
Albertson's	300
Davidson Companies	251
US Post Office	218
Heritage Inn	190
MSU-College of Technology	190
The Great Falls Tribune	180
Burlington Northern/Santa Fe	180
Park Place Health Care	160
Express Personnel	150
University of Great Falls	126
Target	115
Shopko	100
Montana Refining Co.	78
Pasta Montana, LLC	59

Source: Montana Department of Labor and Industry, Research & Analysis Bureau; GFDA, no date.

The breakdown of Great Falls' labor force by industry is shown in Table 3-32.

Table 3-32. Industry Annual Average Employment in Great Falls

Private Business	27,212
Agriculture, Forestry, Fish	314
Manufacturing	1,216
Transportation, Communication, Utilities	1,512
Wholesale Trade	1,557
Retail Trade	8,196
Finance, Insurance, Real Estate	2,323
Services	10,325
Government	5,356
Total of all industries	**58,011**

Source: Montana Department of Labor and Industry, Research & Analysis Bureau); GFDA, no date.

Between 1995 and 2005, the labor force of the Great Falls Metropolitan Statistical Area (MSA) grew slightly from about 37,000 to a peak of about 40,800; the labor force was 9 percent larger at the end of this 10-year period (Table 3-33). The unemployment rate of the Great Falls MSA held relatively steady between 1995 and 2005, ranging between 4-5 percent. In 2005 through October, the MSA has had a slightly lower unemployment rate than the United States as a whole.

Metropolitan Statistical Area (MSA)
As defined by the federal Office of Management and Budget, an MSA is an urban area that meets specified size criteria: either it has a core city of at least 50,000 inhabitants within its corporate limits, or it contains an urbanized area of at least 50,000 inhabitants and has a total population of at least 100,000. The Great Falls MSA is coincident with Cascade County.

Labor Market Area

Because the economic impacts of the Proposed Action at either site extend beyond the political boundaries of Great Falls, the Great Falls Labor Market Area (LMA) provides a more comprehensive look at the affected economic environment of the region. A labor market area is an economically integrated geographic area within which individuals can reside and find employment within a reasonable distance or can readily change employment without changing their place of residence (BLS, 2005). Normally, it is based on a 60-mile (97 km) radius from some pre-set point, such as the county seat, 60 miles (97 km) being about a one-hour drive. The Great Falls Labor Market Area corresponds approximately to the Great Falls MSA above.

The Great Falls Development Authority estimates that approximately 14,900 workers are available to employers, as shown in the pie chart below (Figure 3-61) (GFDA, no date).

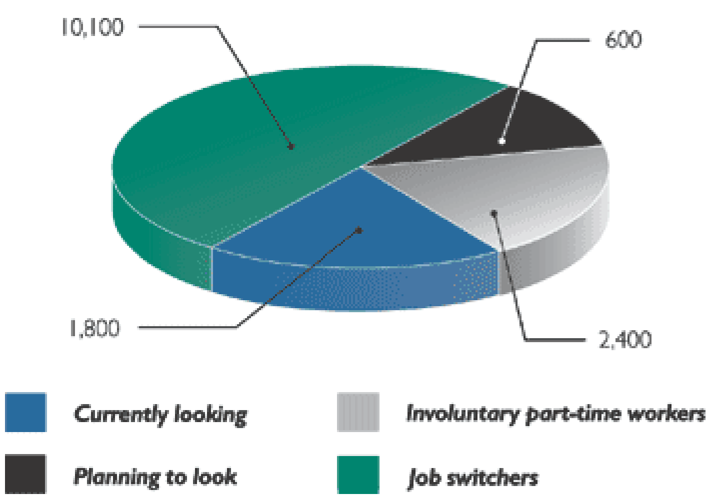
There are 13 major and/or chain hotels in Great Falls, with more than 1,300 rooms available to rent (Hotel-Guides.us, 2005). In the 2000 Census, 35,225 housing units were counted in Cascade County, of which 62 percent were detached, single-family houses and 10 percent were mobile homes; the remainder consisted of attached townhouses, condominiums, and apartments (USCB, 2000b). Of these 35,225 housing units, 32,547 were occupied, for an occupancy rate of 92 percent, a vacancy rate of 8 percent, and 2,678 vacant units. Eighty-two percent of the housing units were heated with utility-supplied natural gas.

Table 3-33. Average Annual Unemployment Rate for the Great Falls, MT Metropolitan Statistical Area vs. U.S. Unemployment Rate[1]

Year	Labor Force	Employment	Unemployment	Unemployment Rate (%)	U.S. Unemployment Rate (%)
1995	37,259	35,396	1,863	5.0	
1996	37,073	35,225	1,848	5.0	
1997	37,537	35,554	1,983	5.3	
1998	37,962	35,882	2,080	5.5	
1999	36,858	34,839	2,019	5.5	
2000	38,287	36,386	1,901	5.0	
2001	38,419	36,719	1,700	4.4	
2002	38,411	36,776	1,635	4.3	
2003	38,558	36,922	1,636	4.2	
2004	39,209	37,566	1,643	4.2	
2005 Jan.	40,262	38,116	2,146	5.3	5.2
2005 Feb.	40,217	38,178	2,039	5.1	5.4
2005 Mar.	40,376	38,268	2,108	5.2	5.2
2005 April	40,773	39,049	1,724	4.2	5.2
2005 May	40,377	38,808	1,569	3.9	5.1
2005 June	40,494	38,621	1,873	4.6	5.0
2005 July	40,740	39,156	1,584	3.9	5.0
2005 Aug.	40,542	38,895	1,647	4.1	4.9
2005 Sept.	39,861	38,300	1,561	3.9	5.1
2005 Oct.	40,723(p)	39,137(p)	1,586(p)	3.9(p)	5.0

Source: BLS, 2005
[1]Not seasonally adjusted for Great Falls; seasonally adjusted for U.S.
p= preliminary

Figure 3-61. Great Falls Labor Market and 30-mile (48 km) Radius Surrounding Area



Source: GFDA, no date

3.14 ENVIRONMENTAL JUSTICE/PROTECTION OF CHILDREN

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs Federal agencies to identify and address any disproportionately high adverse human health or environmental effects of its projects on minority or low-income populations.

Cascade County does not have disproportionate numbers of minorities or a disproportionate level of poverty relative to the State of Montana. Its population is 1.1 percent black (compared to 0.3 percent for all of Montana), 4.2 percent American Indian (6.2 percent for Montana), 0.8 percent Asian (0.5 percent for Montana), and 2.4 percent Hispanic (2.0 percent for Montana). In Cascade County, 13.5 percent of persons lived below the poverty line in 1999, compared to 14.6 percent for the state as a whole (USCB, 2005b).

Historically, the Great Falls area was inhabited primarily by the Plains Indians and the Blackfeet Indian Nation. There are no Indian reservations or other tribal lands currently in the County, though the Little Shell Indian Tribe, made up of approximately 4,000 Chippewa Indians, considers Cascade County its homebase. The Little Shell Indians applied for federal recognition as a tribe in 1984 and received preliminary approval in 2000. The tribe is currently awaiting final official recognition. The tribe hopes to acquire tribal lands within Cascade County following recognition. In November 2005, Cascade County commissioners passed a resolution supporting the Little Shell Tribe's quest for 200 acres (80 ha) in the Great Falls area pending their recognition. Approximately 800 Little Shell tribal members currently live in Cascade County (Tribune, 2005).

Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, directs federal agencies to "identify and address environmental health risks and safety risks that may disproportionately affect children." Order 13045 further directs federal agencies to "ensure that [their] policies, programs, activities, and standards address disproportionate risks to children that result" from these risks.

Generally, children are not present on the subject properties, or in their immediate vicinity, but may be presumed to live in residences southwest of the Industrial Park site and in and around the city limits of Great Falls.

An independent report on environmental justice in Cascade County was generated from Scorecard (Scorecard Copyright © 2005). Scorecard profiles environmental burdens in every community in the U.S., identifying which, if any, groups experience disproportionate toxic chemical releases, cancer risks from hazardous air pollutants, or proximity to Superfund sites and polluting facilities emitting smog and particulates. The report indicates that there is no disproportionate distribution of environmental burdens within Cascade County to groups based on race/ethnicity, education level, job classification, or home ownership status (Scorecard, 2005). Additionally, there is no disproportionate distribution within the county of chemical releases, cancer risks from hazardous air pollutants, or proximity to Superfund sites. However, there is some increased burden from existing facilities emitting criteria air pollutants near families and

children below the poverty line when compared to families and children above the poverty line. Approximately 7.4 facilities emitting criteria air pollutants are located within one square mile of families and children below the poverty line within the county, compared to an average of 3.7 such facilities located within one square mile of families and children above the poverty line (Scorecard, 2005).

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4.0 ENVIRONMENTAL CONSEQUENCES

In response to public comments, RD and DEQ have made a number of edits to the text of Chapter 4. Other than updated maps to reflect the modified location of the HGS, there are no large changes. Any additions or changed text in the FEIS from the DEIS as a result of public comments are shown in double underlining. Deletions are not shown.

4.1 INTRODUCTION

Chapter 4 assesses the potential environmental consequences associated with the Proposed Action consisting of the construction and operation of the proposed HGS and four wind turbines at the Salem site) and secondary action(s) including the construction and operation of power transmission lines, a rail spur, and potable, raw water and wastewater lines. Hereafter, the term "Proposed Action" will include all related secondary actions as they are necessary for the operation of the HGS or to meet the purpose and need of the Proposed Action. Connected Actions are possible projects or activities that may be linked to the Proposed Action or secondary action(s). There are two connected actions associated with the proposed HGS at the Salem site. Both pertain to mining of minerals needed for the operation of the HGS. These connected actions are not considered this EIS.

The main connected action is the surface mining and transport of coal to supply fuel for the generating station. However, environmental impacts associated with the particular mine or mines (Spring Creek and/or Decker, in Montana's Powder River Basin) from which coal would be purchased to fuel the HGS are already addressed in previous EISs (USGS-MDSL, 1977; USGS-MDSL, 1979; MDSL, 1980). These EISs are incorporated by reference into the present EIS.

Another connected action is the mining and transport of limestone from the Graymont Indian Creek Lime Plant and quarry near Townsend. This limestone quarry/plant is an existing facility that has been evaluated with the appropriate level of MEPA analysis and has operating permit #00105 from DEQ.

Potential environmental consequences can be direct or indirect, on-site and/or off-site. Direct impacts are those that are directly caused by the Proposed Action, like an increase in air pollutants emitted. Indirect impacts are those that follow in turn from the primary or direct impact; increased air pollutants, for example, could lead to increased smog, visibility impairment in Class I areas like national parks and wilderness areas, or increased deposition of toxic substances and their uptake by living organisms.

Potential environmental consequences are discussed under each resource topic for three possible alternatives related to the Proposed Action: 1) No Action, in which no HGS would be built at the Salem or alternate (Industrial Park) site; 2) Proposed Action, or the construction and operation of the HGS at the preferred Salem site east of Great Falls; and 3) construction and

operation of SME's proposed generating station at the alternate site, which is the Industrial Park location just north of the City of Great Falls. Consequences of mitigations are also discussed.

4.2 METHODOLOGY

MEPA and NEPA both require the disclosure of more than the direct and indirect effects. Rather than include the following three categories with each resource, they are combined at the end of the chapter so the reader can understand the overall effects of these categories of effects.

- Neither NEPA nor MEPA requires an agency to avoid adverse or even significant effects, but they must be disclosed. Typically, agencies attempt to avoid, minimize, reduce, or mitigate adverse affects. "*Unavoidable*" adverse effects are those that would occur regardless of the proposed mitigations or other actions that would eliminate adverse effects.

- The "*relationship between short-term uses and long-term productivity*" varies somewhat according to resource. Short-term uses of a resource could be for a couple of years or the life of the project. Long-term productivity may refer to productivity during the life of the project and beyond for some resources and for others long term would only apply when the project is completed. The key to this section is to look at the trade-offs between short-term uses and long-term productivity with and without the Proposed Action, Agency Alternative, and any mitigations. The gains and losses are described.

- An irreversible or irretrievable commitment of resources would occur when resources were either consumed, committed, or lost as a result of the project. The commitment of a resource would be "***irreversible***" if the project started a "process" (chemical, biological, and/or physical) that could not be stopped. As a result, the resource, or its productivity, and/or its utility would be consumed, committed, or lost forever. Commitment of a resource would be considered "***irretrievable***" when the project would directly eliminate the resource, its productivity, and/or its utility for the life of the project or some period of time, but the resources would recover.

The interdisciplinary study team (see Chapter 7, List of Preparers) followed a structured process to analyze the potential environmental impacts, or effects, resulting from the two alternatives for constructing and operating a coal-fired electricity generating station for SME. This procedure, called the cause-effects-questions process, is described the six steps outlined in the following text box.

Using this process, both direct and indirect effects that could potentially occur as a result of different management scenarios were identified. As mentioned above, direct effects are impacts that would be caused by the alternative(s) at the same time and in the same location as the action. Indirect effects are impacts that would be caused by the alternative(s) that occur later in time or farther removed in distance than the action, or, as described above, by means of a longer chain of cause-and-effect linkages.

Causes-Effects-Questions:
A Structured Analytic Process

Step 1: Identify the specific activities, tasks, and subtasks involved in the Proposed Action(s) and alternative(s) (Table 4-1).

Step 2: For each specific activity, task, and subtask, determine the full range of direct effects that each could have on any environmental resource. For example, removing vegetation could cause soil erosion. See Appendix K for more detail.

Step 3: For each conceivable direct effect, identify which further effects could be caused by the direct effects. For example, soil erosion could cause stream sedimentation, which could kill stream species, which could diminish the food supply for fish, leading to decreased fish populations. This inquiry can identify multi-stepped chains of potential causes-and-effects. See Appendix K for more detail.

Step 4: Starting at the beginning of each chain of causes-and-effects, work through a series of questions for each potential effect:

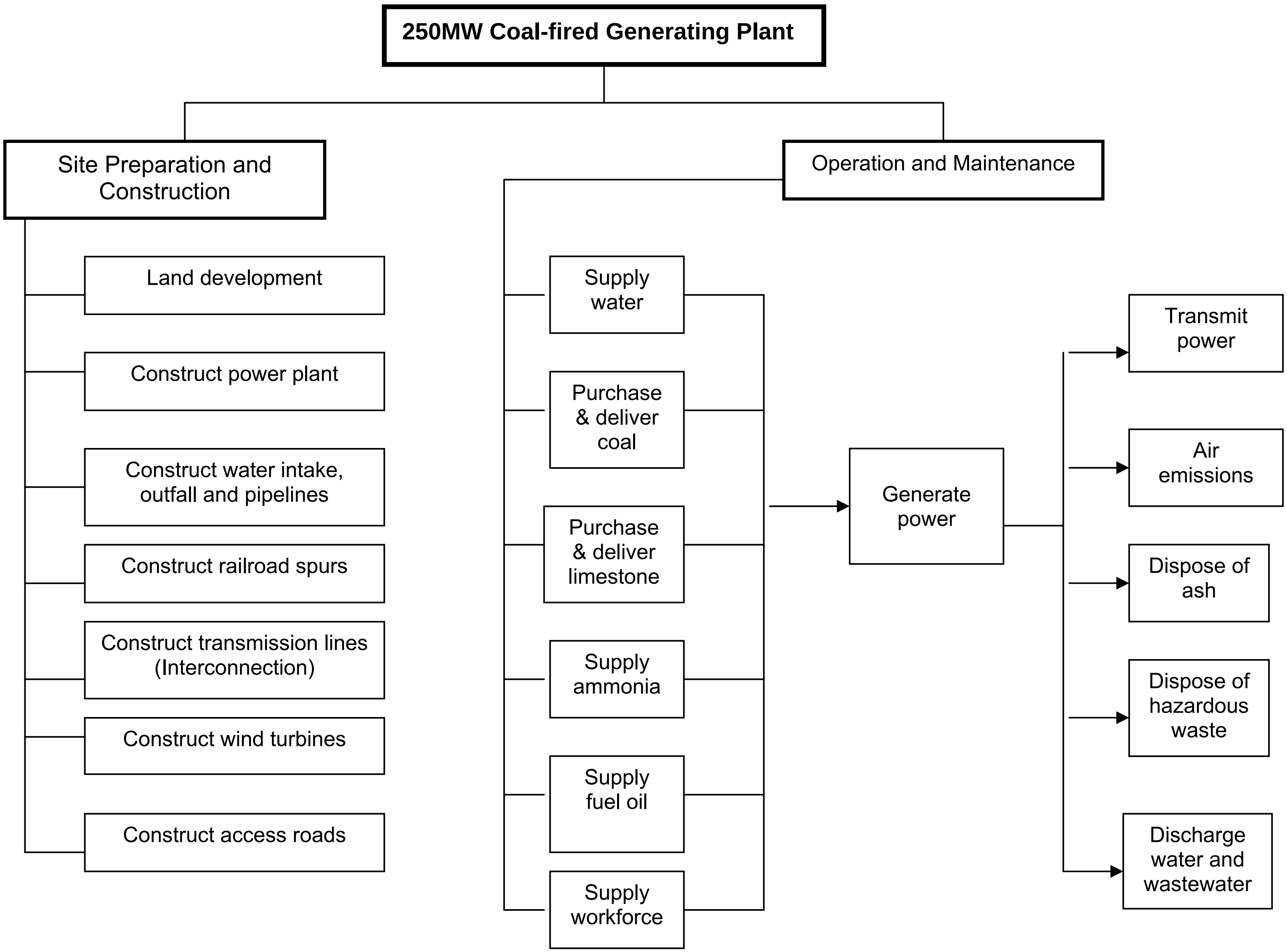
- Would this effect actually occur from this project?
  If not, why not? What would preclude it from happening?
- If the effect cannot be ruled out, characterize which types of data, other information, and analyses are needed to determine the parameters of the effect, including its extent, duration, and intensity. Identify the sources from which the data is to be obtained.

Step 5: Gather the data and conduct the analyses identified by the above steps, utilizing only relevant information.

Step 6: Document the results of this study process.

Figure 4-1 presents the preliminary cause-effects activities and tasks diagram for the proposed SME generating station. Appendix K presents the entire preliminary cause-effects-questions diagram that the study team prepared at the outset of the analysis. This visual aid helped organize the investigation and focus it on relevant issues.

Figure 4-1. Preliminary Cause-Effects Activities and Tasks Diagram for Proposed Southern Montana Electric Generating Station



4.2.1 DEFINITIONS

Discussions of environmental consequences in the following sections will utilize a general vocabulary consisting of the following terms and definitions:

Types of Impact

Beneficial – A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.
Adverse – A change that moves the resource away from a desired condition or detracts from its appearance or condition.
Direct – An effect that is caused by an action and occurs in the same time and place.
Indirect – An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Duration of Impact:

Short-Term – Impact would occur during a transition phase only, or in the case of potential future developments, during the site preparation and construction phases only. Once these phases have ended, many resource conditions are likely to return to pre-transition/construction conditions.
Medium-term – Impact would extend past the transition, or construction phase for future developments; it could conceivably last 5-10 years, and depending on the resource, could persist for the life of a project.
Long-term – Impact would likely persist for 25-30 years or longer, often beyond the project life, depending on the specific resource and type of project.

Context of Impact:

Localized – Impacts would affect the resource area only on the project site or its immediate surroundings, and would not extend into the region.
Regional – Impacts would affect the resource area on a regional level, extending well past the immediate project site.
Worldwide – Impacts would affect the resource on a global level, extending well past the immediate project site and regional area.

Intensity of Impact:

Negligible – The impact is at the lowest levels of detection – barely measurable and with no perceptible consequences.
Minor – Change in a resource occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact to or change in a resource area that is easily defined, noticeable, and calculable but may not be measurable, or exceeds a trigger level.
Significant – The impact to or change in a resource is well defined, highly noticeable, measurable, and meets one or more of the significance criteria described in MEPA or NEPA summarized below, and/or violates an applicable state, federal or local statute or regulation.

4.2.2 EIS Significance Criteria

The Highwood Coal-Fired Power Plant could have a wide variety of impacts on different components of the environment. The importance, or "significance," of each of these diverse impacts depends on several factors. For example, if a state or federal law clearly would be violated by any aspect of the Proposed Action, then that obviously would be a significant impact. Other factors affecting significance are matters of professional judgment, such as the importance of losing some wildlife habitat. The Council on Environmental Quality (CEQ) regulations implementing NEPA and DEQ's MEPA regulations provide a list of factors to be considered in determining impact significance. This EIS is based on an assessment method that combines these multiple factors into an overall assessment of significance. The following major factors influence the significance of most types of impacts:

- Magnitude of the impact (how much);
- Duration or frequency of the impact (how long or how often);
- Extent of the impact (how far);
- Likelihood of the impact occurring (probability).

Several levels were identified for each of these factors, as shown below.

Magnitude:
- major
- moderate
- minor

Duration:
- long term
- medium term (intermittent)
- short term

Frequency:
- often
- intermittent
- seldom

Extent:
- large
- medium (localized)
- small (limited)

Likelihood:
- probable
- possible
- unlikely (improbable)

Combinations of these factors would constitute various overall ratings of significance, as shown in Table 4-1. Given this general structure, specific definitions of these levels for each resource or impact topic were developed for this EIS.

Other factors affecting significance of impacts need to be taken into account during the impact analysis process. CEQ and MEPA regulations both contain the following similar requirements:

- The uniqueness and fragility of the resources or values; CEQ specifically defines different types of geologic features;
- The importance of the resource or value to the state and society, or conversely the degree to which impacts are likely to be highly controversial;
- The degree to which a precedence for future actions with significant impacts would be set as a result of the impact of the Proposed Action; and
- The potential for conflicts with local, state, or federal laws, requirements or plans.

CEQ regulations also include three additional factors that need to be considered:

- The degree to which the proposed action affects public health and safety;
- The degree to which the proposed action may adversely affect or cause the loss of significant scientific, cultural, or historic resources including sites on or eligible for the National Register of Historic Places; and
- The degree to which the proposed action may adversely affect endangered or threatened species or its habitat.

MEPA has one unique additional factor:

- The potential growth-inducing or growth-inhibiting aspects of the impact.

A Proposed Action also may generate impacts that are beneficial with regard to a given topic or resource area, in which case these impacts will be identified as "beneficial." By the same token, in some instances, impacts hypothetically may be neither beneficial nor adverse, or be negligibly beneficial or adverse, in which case they will be identified as such.

Table 4-1. Criteria for Rating Impacts

Levels of Impact				Impact Rating
Magnitude	**Duration**	**Extent**	**Likelihood**	
Major	Any Level	Large or Medium	Probable	**Significant**
Major	Long Term	Large or Medium	Possible	
Major	Medium-term, inter-mittent, or short-term	Any Level	Probable	
Major	Medium-term, inter-mittent, or short-term	Any Level	Possible	**Potentially Significant or <u>Potentially</u> Non-Significant <u>(to be determined on a case-by case basis)</u>**
Moderate	Any Level	Large or Medium	Probable	
Major	Any Level	Small	Probable	
Major	Long-term	Small	Possible	
Moderate	Any Level	Large	Possible	
Moderate	Any Level	Medium or Small	Possible	
Moderate	Any Level	Small	Probable	
Major	Any Level	Large	Unlikely	
Major	Long-term	Medium or Small	Unlikely	
Minor	Any Level	Large	Probable	
Minor	Long-term	Medium or Small	Probable	
Major	Medium-term, inter-mittent, or short-term	Medium or Small	Unlikely	
Minor	Medium-term, intermittent	Medium	Probable	**Non-Significant**
Minor	Any Level	Large	Possible	
Minor	Long-term	Medium or Small	Possible	
Moderate or Minor	Any Level	Any Level	Unlikely	
Minor	Short-term	Medium	Probable	
Minor	Medium-term, inter-mittent, or short-term	Small	Probable	
Minor	Medium-term, inter-mittent, or short-term	Medium or Small	Possible	

4.3 SOILS, TOPOGRAPHY, AND GEOLOGY

4.3.1 NO ACTION ALTERNATIVE

The No Action Alternative would not have any impacts on the topography or the geology of the Salem or Industrial sites. There would be no change to contours or elevations of the land.

There would be no significant adverse impacts on soils from the No Action Alternative, although negligible to minor, long-term adverse impacts would continue from existing land use practices. Even on lands with very little slope, long-term background rates of erosion would continue, particularly on cultivated areas, due to the exposure of soils to wind and water from grazing, tilling, disking, plowing, and movement of farm machinery. This erosion is exacerbated by the high clay content of the soils in the area. Overall, in this area, as throughout most of the High Plains area and the nation as a whole, soil loss rates exceed soil formation rates. In Montana, average erosion rates on crop and pastureland are estimated to be 5.5 tons of soil per acre (12.3 metric tons per hectare) per year (USDA, 2000). Soil formation rates are estimated to be only 10–25% of these erosion rates, leading to a net loss of topsoil over the long term.

Insofar as SME would need to purchase power from existing sources of wholesale supply to meet energy supply needs in the service area, SME would be contributing indirectly to ongoing soil resource impacts, and possibly impacts to geology and topography, at different generating stations in the region or at potentially new generating stations located outside of the region.

4.3.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.3.2.1 Construction

Under the Proposed Action, construction activities on the HGS are anticipated to occur for four years and three months. Two months or more are anticipated to be spent on site grading and site preparation activities. The total area of disturbance for these activities would include the total footprint of the power plant, approximately 545 acres (221 ha), and additional roadway, rail spur, and utility corridor zones. Installation of the proposed wind turbines and related facilities such as access roads and electrical and transmission cables would require several months.

All coal storage and processing facilities would be located within the 545-acre footprint of the power plant. Additionally, this area would include several storm water detention ponds and a waste monofill (Figure 4-2). The monofill would be constructed within the confines of the railroad loop for the disposal of ash and water treatment system byproducts. The monofill area within the rail loop would be laid out in a rectangular grid consisting of approximately 53 acres (21 ha). The monofill would be constructed as nine cells in a grid. Each cell would be an excavated pit approximately 36 feet (11 m) deep. Once filled and covered, the monofill grid would have a height of roughly 22 feet (7 m) above grade. Excavated material would be predominantly fine-grained, high content inorganic clay soils with high plasticity and low permeability, which would be used to construct a clay liner and perimeter containment berms with the balance stockpiled for use as final cover.

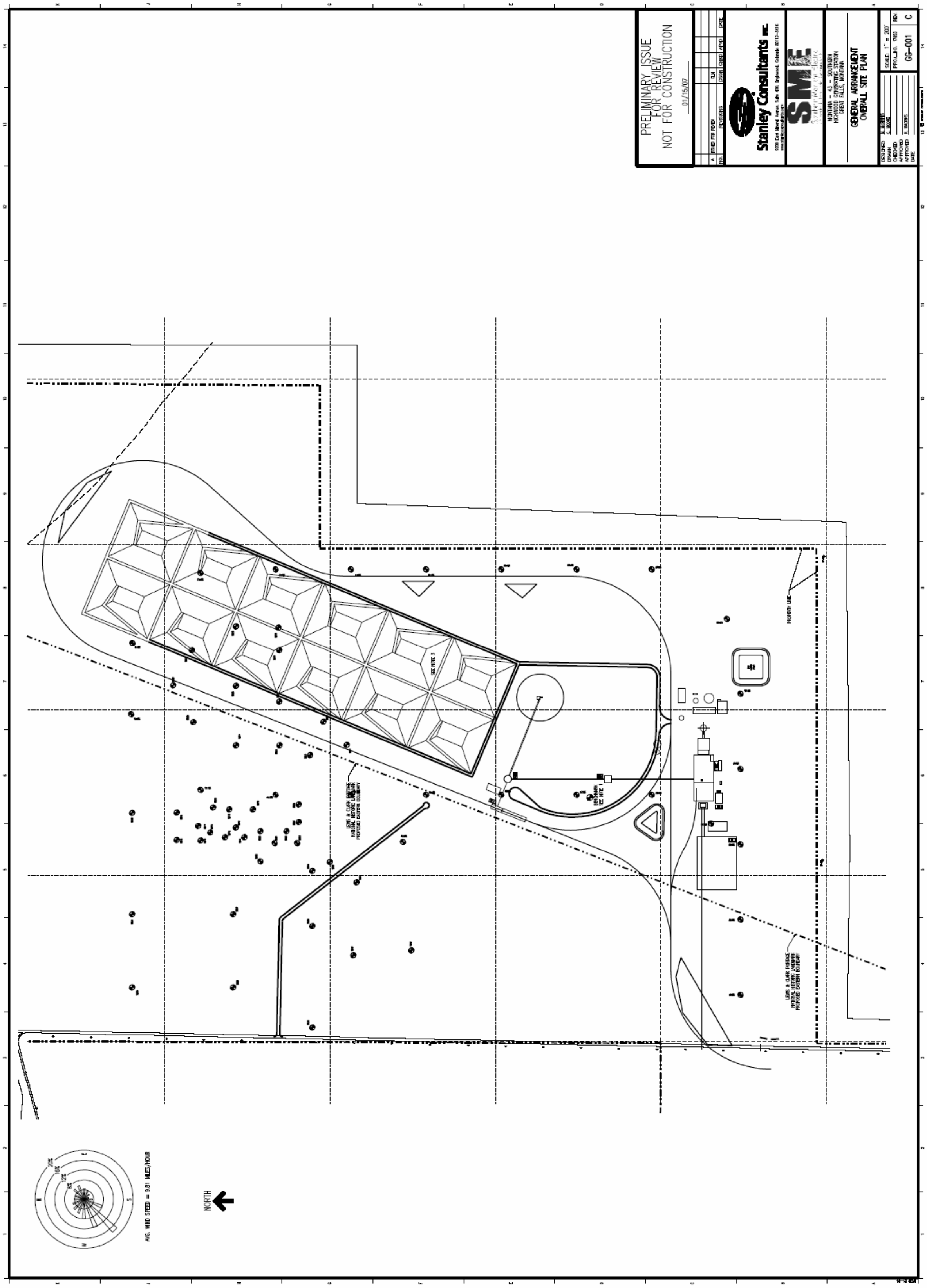


Figure 4-2. Construction Schematic of Ash Waste Monofill

Each cell of the monofill would be designed as a self-contained unit. During initial construction, only one cell (with the associated containment berms) would be constructed. Every three years, a new disposal cell would be constructed, and the excavation materials from this construction would be used as the cover material and topsoil to close the filled cell. The Pendroy Clay soils found onsite are characterized by very slow water transmission rates and infiltration rates. This material would be recompacted at optimum moisture content to create an engineered clay liner for the cell. As each cell is filled, a final cover would be placed on the cell. The final cover is designed to retain the precipitation that falls on the final cover and maximize evaporation and transpiration by the plants grown on the cover. The cap would be constructed with a gravel layer immediately on top of the ash to serve as a capillary break. The gravel would be covered with 48 inches of native on-site materials that would function as subsoil. The capillary break prevents the subsoil from losing water into the waste. Six inches of topsoil would be applied and planted with suitable vegetation to minimize erosion and transpire the moisture retained in the cap. This type of cap, know as an evapotranspiration (ET) cap, is in common use at Class II landfills and other waste repositories in Montana. It is easier to construct and maintain than a compacted clay cap and mimics the natural soil conditions while preventing infiltration. The seeded areas would be maintained along with the balance of the site landscaping for the life of the plant.

With the exception of retention ponds and the monofill site, all areas within the footprint of the site would be contoured to an even grade according to design specifications, and the net balance between soil cut and fill is anticipated to be even (Walters, 2006). If, at any point, soil is stockpiled on site, the stockpile would be stabilized and/or covered, utilizing best management practices.

For access to the construction site, the existing aggregate roadways currently leading to the site would be maintained. At the end of the construction period, these existing roadways would be regraded and covered with additional aggregate. A 1,800-ft. (545 m) long paved access road into the site would be constructed and maintained from the existing Cascade County road, Salem Road.

Additionally, 6,600 feet (2,012 m) of paved internal roadways would be constructed to facilitate both the construction and operations phases of the plant. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction. Internal road construction would take six months.

A 6.3-mile (10.1-km) railroad spur would be installed at the Salem site in order to transport and supply coal to the HGS. The spur would extend south from the plant and tie into existing main line track that is located three miles (five kilometers) south of the city of Great Falls. Although the railroad spur would not cross any waterways, it would cross agricultural lands and Montana State Highway SR 228, Highwood Road, which would require a raised highway (SME, 2005e). When railroad track is laid down, it would permanently remove or cover up arable soils on the agricultural lands to be crossed.

Additionally, two short segments of electrical transmission line would be constructed; the first line segment, approximately 4.1 miles (6.6 m) long, would extend from the plant site to a new switchyard site proposed for a location south and west of the Salem site; the second line

segment, approximately 9.21 miles (14.82 km) in length, would extend south and west from the plant site, crossing the Missouri River north and east of Cochrane Dam. Both line segments would be constructed in new rights-of-way typically extending 50 feet (15 m) either side of centerline. All poles and structures associated with the transmission lines would be directly embedded utilizing native or engineered soils, in the event that additional soil is needed as backfill.

Construction of the raw water supply system would include a collector well which would use a passive intake screen installed on the end of a lateral pipe that extends into the Morony Reservoir. A reinforced, below-grade, concrete caisson (vertical cylinder used as a sump) would be constructed near the river and would serve as the intake's "wet well." A fully enclosed pump house would be located on the top of the caisson with a finish floor elevation at approximately grade.

Installation of the four wind turbine generators (WTGs) would involve temporary disturbance of soils from various activities. Excavation and grading would be required at each WTG location for foundation placement, as well as a temporary crane pad for tower erection. The total area of site disturbance for each tower is estimated at approximately 1.1 acres (0.4 ha), or 4.4 acres (1.6 ha) total. A portion of the excavated native soil materials would be used to establish natural drainage away from the turbine tower foundation. Additional soils disturbance would occur for installation of high voltage underground cable (collection system), communications cable and the electrical grounding system between the HGS Switchyard and WTG locations. A total of approximately 3,300 feet (1,000 m) of excavated trench, typically three feet wide by four feet deep (0.9 m by 1.2 m) would be required.

Ongoing operation and maintenance at WTGs would require construction of approximately 2200 lineal feet of access roads. Road construction impacts would be reasonably small considering the relatively minor change in elevation between WTG locations, the HGS plant site and existing county road. Access road construction would be limited to placement of pit run and final road base gradation materials to establish a 25-foot (8-m) wide drivable surface with elevations of 12 inches or more above natural grade, or as otherwise required to interface with an improved primary plant access road. Culverts to re-establish natural drainage would be utilized where required; in addition, riprap and flow diversion devices would be specified as required for erosion protection. Top soils removed at the start of construction would be spread adjacent to completed roadways and disturbed areas would be reseeded with natural vegetation. Impacts to topography and geology from erecting the WTGs would be negligible; impacts to soils would be negligible to minor, localized, and temporary to short-term.

Construction equipment to be used during the various facets of site development for both the power plant and WTGs would include bulldozers, backhoes, cranes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, and compactors.

As with almost any construction project involving the use of heavy equipment, there is some risk of an accidental fuel or chemical spill, and the potential contamination of soils. Fuel products (petroleum, oils, lubricant) would be needed to operate and fuel excavation equipment. To

reduce the potential for soil contamination, fuels would be stored and maintained in a designated equipment staging area. Oils and lubricants are usually stored in metal storage cabinets appropriately labeled, often inside a garage or maintenance shed. A person(s) designated as being responsible for equipment fueling would closely monitor the fueling operation, and an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, would readily be available on site in the event of an accidental spill. Following these precautions, the potential for an accidental chemical or fuel spill to occur and result in adverse impacts on soils would be negligible.

Construction equipment also has the potential to compact soil, reducing the porosity and conductivity of the soil. Such compaction is likely to slightly increase the amount of surface runoff in the immediate area. The underlying soil in the area of the site, Pendroy Clay, is already characterized by high runoff potential and relatively high soil erosion potential. Stabilization of the soils would be vital to prevent sediment runoff impacts to off-site water sources, possibly degrading water quality.

Siltation, or sedimentation, is a leading cause of stream and river impairment in Montana and the U.S., as it can cause disturbances in aquatic ecosystems. The National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act prohibits the discharge of any pollutant, including sediments, to waters of the United States. The discharge of storm water runoff from construction sites is regulated under the NPDES program. Typically, sediment erosion rates from construction sites are 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those of forest lands (DEQ, 2003). Construction activities disturbing five acres or more of land are regulated by Phase I of the NPDES program. In Montana, DEQ is authorized to administer the NPDES Program through the Montana Pollutant Discharge Elimination System (MPDES) Program.

DEQ's Water Protection Bureau/Storm Water Program has issued general MPDES permits for construction sites, the chief requirement of which is the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP). SWPPPs contain measures to reduce soil erosion and prevent pollution from petroleum, oil, and lubricants (POLs) and other chemicals or hazardous/toxic materials at construction sites. Specifically, SWPPP plans assess the characteristics of the site such as nearby surface waters, topography, and storm water runoff patterns; identify potential sources of pollutants such as sediment from disturbed areas, and stored wastes or fuels; and identify Best Management Practices (BMPs) which would be used to minimize or eliminate the potential for these pollutants to reach surface waters through storm water runoff.

BMPs at construction activity sites typically consist of various erosion and sediment control measures. At the Salem site, silt fences, straw bales, and other temporary measures would be placed in ditches and along portions of the site perimeter to control erosion during construction activities. At each outfall location, temporary sediment basins would be constructed and maintained until site vegetation is firmly established. These temporary sediment basins would be constructed before mass grading begins, so that they are in place and working for the entire construction period. Regular inspections of the erosion and sediment control measures would be

performed after major storm or snowmelt events by qualified personnel, and as required in the MPDES General Permit.

In addition to preventing sediments from entering water bodies, erosion control methods would be in place to control the fugitive dust produced during construction activities. Dust control would be obtained through the use of water wagons on exposed earth or as required, the application of dust palliative on gravel surfaces. No human disturbances are anticipated, due to the lack of potential receptors in the immediate vicinity of the Salem site.

All disturbed areas (excluding those required for plant operations) would be stabilized and revegetated following completion of construction activities. Soils are likely to have been compacted during construction and would need to be ripped to reduce compaction prior to soil replacement. In addition, fertilizer and mulch may be needed to facilitate plant establishment. Proper seed selection would result in grasses with deep root systems and denser foliage, which would increase local retention times and reduce site outflows.

The construction activities would involve the conversion of existing agricultural lands into impervious areas. Increased urbanization and loss of pervious soils may result in increased surface runoff, perhaps contributing incrementally to localized drainage issues.

4.3.2.2 Operation

With the minor exception of the open monofill cell used in the disposal of ash, site soils would be stabilized once the proposed power plant is operational. Dust abatement would continue to occur on an as-needed basis on gravel surfaces.

The operation of the proposed power plant could hypothetically result in localized contaminant loading into the soil due to percolation of precipitation through coal stockpiles or leachate from the ash infiltrating into the soil from the monofill cells. The water would run off these piles or through the ash waste and could flush heavy metals such as arsenic and lead, which are inherently present in coal in trace amounts, into nearby soils where they could be adsorbed as the water slowly infiltrates down through the soil column. Leaching tests on the ash from proposed coal sources show no to very low concentration of specific metals will leach and that if any leachate was produced, it would be magnitudes lower than the standards for drinking water. Additionally, given the great depth to groundwater and the impermeability and thickness of clayey soils on site, the potential for extensive contamination problems is regarded as very low. Go to Section 4.13.2.2 for more information on ash disposal.

To further minimize any soil contamination, runoff within the power plant would be carefully managed. The ash monofill would be lined with compacted clay and groundwater in the vicinity of the monofill cells would be monitored. If contamination of soils is detected, SME would be required to follow the steps outlined in the site's Spill Prevention Control and Countermeasures Plan (SPCCP), or equivalent contingency and emergency plan, and the DEQ-approved solid waste management plan.

4.3.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.3.3.1 Construction

Construction activities at the alternative site would be very similar to those described for the Proposed Action, the Salem site, except that they would not include the wind turbines. Construction timing would be anticipated to be the same, though the total area of disturbance would be only about half that of the Salem site. At the Industrial Site, the total area of disturbance for construction activities would include the total footprint of the power plant, which is several hundred square feet less than at the Salem site, and additional roadway, rail spur, and utility (pipeline and transmission line) corridor zones.

An ash disposal monofill would not be constructed at the site due to space constraints. For access to the construction site, SME and its contractors would maintain existing aggregate roadways to be used for construction access across the Industrial Park. They would regrade and place additional aggregate on these existing roadways at the end of the construction period. SME and its contractors would also construct and maintain all paved internal roadways to facilitate plant construction and operations. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction.

Eight miles (13 km) of new track and railroad bed would be needed, slightly more than the distance for the Salem site. The rail spur would start north of the Missouri River and travel north and west to the plant site. A 4.5-mile (7.2-km) long pipeline (compared to less than three miles for the Salem site) would be needed to transport make-up water from an intake structure on the Missouri River to the plant. Precise locations of transmission line corridors have not yet been determined, though it is likely that one transmission line would go to the Great Falls Switchyard, which is about 5.5 miles east of the Industrial Park site. A second line of 18 miles in length would likely be built to a switchyard installed on the Great Falls to Ovando line. The specific rights-of-way for potable water and wastewater lines have been selected, and are 1.5 and two miles in length, respectively, which are shorter than for the Salem site.

Construction equipment used during site development would be the same as the Proposed Action, and would include bulldozers, backhoes, cranes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, and compactors. Impacts from the use of this equipment are described under the Salem site section.

A storm water MPDES permit for construction sites would be required for the Industrial Park site. BMPs employed at this site would be expected to mirror those described for the Salem site. The construction activities would involve the conversion of existing agricultural lands into impervious areas. Increased urbanization and loss of pervious soils might result in increased surface runoff, perhaps contributing incrementally to localized drainage and flooding issues.

4.3.3.2 Operation

Site soils would be stabilized once the proposed power plant is operational at the Industrial Park site. Dust abatement would continue to occur on an as-needed basis on gravel surfaces.

As discussed under the Salem site, the operation of the potential power plant may result in contaminant loading into the soil due to percolation of precipitation through coal stockpiles. Any runoff within the power plant would be carefully regulated and managed. If contamination of soils is detected, SME would be required to follow the steps outlined in the site's SPCCP, or equivalent contingency and emergency plan, and the DEQ-approved solid waste management plan.

Since the on-site ash monofill would not be constructed at the Industrial Park site, an alternative disposal location for the ash would have to be found. Either an off-site landfill of the same size as the Salem site would have to be licensed, constructed and operated, or the ash would have to be placed in another existing licensed solid waste management facility. The same volume of ash, 228 tpd, would have to be managed. Disposal at a new landfill would possibly require more road construction than at the Salem site, but the total amount of disturbance would not be known until the site was actually selected. The road construction standards might change because the haul to the new landfill would have to be done in smaller, road-worthy trucks. The use of an existing landfill would prematurely fill the landfill and would require that the solid waste facility be replaced earlier than it otherwise would be without the additional material from the power plant. Road-worthy trucks might also be needed to haul ash to an existing facility.

4.3.4 CONCLUSION

The No Action Alternative would not have any impacts on the topography or the geology of the Salem or Industrial sites. There would be no change to contours or elevations of the land. There would be no significant adverse impacts on soils from the No Action Alternative, although negligible to minor, long-term, possibly adverse impacts would continue from existing agricultural land use practices. Insofar as SME would need to purchase power from other generation sources of wholesale supply to meet energy its supply needs, it would be contributing indirectly to ongoing soil resource impacts, and possibly impacts to geology and topography, at different generating stations in the region or at potentially new generating stations located outside of the region.

The construction of a power plant and related facilities at the Salem and Industrial Park sites would involve extensive site grading and excavation activities that would disturb a considerable amount of soil and alter the topographic contours of the respective sites. Because the sites are relatively flat, the impacts associated with topography are considered negligible. Impacts to soil resources from construction activities at the Salem site would be slightly larger than those at Industrial Park site, due to the ash disposal monofill construction at the Salem site. At the Salem site, soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, medium extent, and probable likelihood. The soil resource impacts from construction at the Industrial Park site would be of minor magnitude, medium-term duration, and medium extent, and have a probable likelihood of occurring. The overall rating for impacts on soil from the construction phase of the power plant would be adverse and non-significant for both the sites.

Due to the operation of the waste monofill for the duration of the plant's life, operation-related impacts on soil resources for the Salem site would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. Soil that is stockpiled while a monofill cell is being filled would have to be stabilized and monitored on a consistent basis. The impacts of plant operation on soil at the Salem site would be adverse and most likely non-significant.

Operation-related impacts on soil resources for the Industrial Park site would be of minor magnitude, short-term duration, and small extent, and have a possible likelihood of occurring. Soils are anticipated to be completely stabilized upon commencement of plant operations, and the only outstanding impacts to soil remain the permanent increase in impermeable surface area and the risk associated with soil contamination from site runoff or leachate. The impacts of plant operation on soil at the Industrial Park site would be adverse and non-significant. Nevertheless, since the amount of ash waste would not change, an alternative disposal site would have to be located. Impacts to soils at a new location are unknown and site-dependent.

4.3.5 MITIGATION MEASURES

The compliance with the terms and conditions of the MPDES permit and the extensive use of best management practices (BMPs) during all construction activities would minimize the loss of soil due to erosion. Additionally, the regulation of all runoff within the power plant grounds, groundwater quality monitoring in the vicinity of the monofill cells, and adherence to a site-specific SPCCP, equivalent contingency and emergency plan, or DEQ-approved solid waste management plan would reduce the risk of a major adverse impact on soil resources to below the level of significance.

Oils, lubricants, and other chemicals would be stored inside a garage or maintenance shed within metal storage cabinets appropriately labeled. A person(s) designated as being responsible for equipment fueling would closely monitor the fueling operation, and an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, would readily be available on site in the event of an accidental spill.

To minimize erosion and stabilize soils, all areas disturbed during construction would be stabilized, graded, and revegetated with appropriate grasses and forbs (using seeds) as soon as possible afterwards. Compacted soils may require ripping to mitigate the effects of compaction and allow roots to properly penetrate, develop, and obtain oxygen, moisture and nutrients; in addition, mulching and/or fertilizer may be needed to encourage initial plant growth.

4.4 WATER RESOURCES

4.4.1 NO ACTION ALTERNATIVE

The No Action Alternative would not significantly, adversely affect water resources at or near the Salem site or the Industrial Park. However, negligible to minor, long-term adverse impacts would continue from existing land uses.

Runoff from the agricultural lands on the sites can carry sediments, and possibly nutrients and other pollutants, to surface waters where they can potentially degrade water quality. Sedimentation is a leading cause of stream and river impairment in Montana and the U.S, and it can cause disturbances in aquatic ecosystems such as the degradation of fish spawning grounds, the potential reduction of recreational activities, increased cost of domestic water purification and decreased life span of dams and levies. Continuing agricultural practices such as grazing, plowing, disking, harvesting, fertilizing, and using pesticides (e.g. herbicides, fungicides, insecticides) on the Salem or Industrial Park sites would contribute incrementally (albeit to a minute extent) to this distant, regional water quality problem.

Insofar as SME would need to meet its energy supply needs by purchasing power from generation sources located elsewhere, SME could potentially be contributing indirectly to ongoing water resource impacts at different generating stations in the region or at potentially new generating stations located outside of the region.

4.4.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.4.2.1 Construction

Under the Proposed Action, construction activities would last approximately four years and three months. The maximum area of disturbance for these activities would include the total footprint of the power plant, approximately 545 acres (221 ha) (though not all of this would be disturbed), a water intake structure and associated pipelines, and additional roadway, rail spur, transmission lines, and utility corridor zones. Installation of the proposed wind turbines and related facilities such as access roads and electrical and transmission cables would require several months.

General construction impacts associated with the upland sites (the plant footprint and transportation corridors) could indirectly affect water resources by increased storm water runoff from the sites carrying sediment and contamination loads into surface water, and by contamination from construction equipment and activities infiltrating area soils and percolating down into the groundwater. Direct impacts to water resources from construction activities include the construction of the water intake structure in the Morony Reservoir, the installation of a transmission line and pipeline within the watershed of the Missouri River, and excavation and soil disturbance from installing four proposed wind turbines on site.

Under existing conditions, the main footprint of the Salem site drains to four distinct outfall locations. Drainage areas vary in size from 26 to 94 acres (11-38 ha). Along the western boundary of the site, storm flows are routed through in-place culverts under Salem Road. To the north and east, flows are to local coulees.

Under the Proposed Action, the Salem site would remain gravity drained. Disturbed areas would be revegetated. Proper seed selection would result in grasses with deep root systems and denser foliage, which would increase local retention times and reduce site outflows.

Internal site drainage would be accomplished through the use of open ditches and culverts. Most ditches would have a nominal slope of 0.5 percent and a width of six feet (two meters). This

wide, flat shape would encourage infiltration of storm flows and would further reduce site outflows. Where concentrated flows intersect undisturbed ground, or where existing soils are erosive, riprap would be placed to reduce flow velocities. While the four outfalls would be maintained, the majority of them would have a reduced drainage area. One area would remain the same size and three areas would have an increase in drainage area (8.8 to 9.0 acres, 207 to 224 acres, and 58 to 105 acres). Detention storage of seven acre-feet and four acre-feet would be provided at the two larger areas; these detention areas are labeled as North Pond and South Pond in Figure 4-3 below. This detention storage would reduce peak outflows during future storm events such that they would not exceed peak outflows experienced under existing conditions.

During site preparation and grading activities, soils in the construction areas may become exposed, rutted, and compacted. Soil exposure, rutting, and compaction have the potential to increase water yields from sites, concentrate and channelize sheet flow, increase erosion rates, and increase sediment delivery to nearby waterbodies. These effects, if unmitigated, could deliver small quantities of sediment and nutrient loadings to the Missouri River or its tributaries, which as already noted, are currently impaired by excess silt and nutrient concentrations.

Best Management Practices (BMPs), such as silt fences, straw bales, and other temporary measures, would be placed in ditches and along portions of the site perimeter to control erosion during all construction activities. At each outfall location, temporary sediment basins would be constructed and maintained until site vegetation is firmly established. These temporary sediment basins would be constructed before mass grading begins, so that they are in place and working for the entire construction period.

As with almost any construction project involving the use of heavy equipment, there is some risk of an accidental fuel or chemical spill, which could adversely affect water quality if the spilled chemical were to percolate into groundwater or directly enter and adjacent surface water body. Fuel products (petroleum, oils, lubricant) would be needed to operate and fuel both construction and water pumping equipment. Fueling activities would be restricted to the equipment staging area, away from drainages. To reduce the potential for water resource contamination, fuels would be stored and maintained in a designated equipment staging area, away from water bodies.

A person(s) designated as being responsible for equipment fueling would closely monitor the fueling operation, and an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, would readily be available on site in the event of an accidental spill. Following these precautions, the potential for an accidental chemical or fuel spill to occur and result in adverse impacts on water resources would be negligible.

Direct impacts to water resources from construction activities would occur from the construction of the water intake structure in the Morony Reservoir and the installation of transmission lines and water and wastewater pipeline within watersheds of the Missouri River and tributaries.

As part of the construction of the intake structure, a concrete caisson (vertical, cylindrical water-tight structure in which construction work is carried out) would be constructed several hundred feet landward from the edge of water. The pipeline would be jacked or drilled horizontally through the riverbank and extended out into the Morony Reservoir. The pipeline would emerge

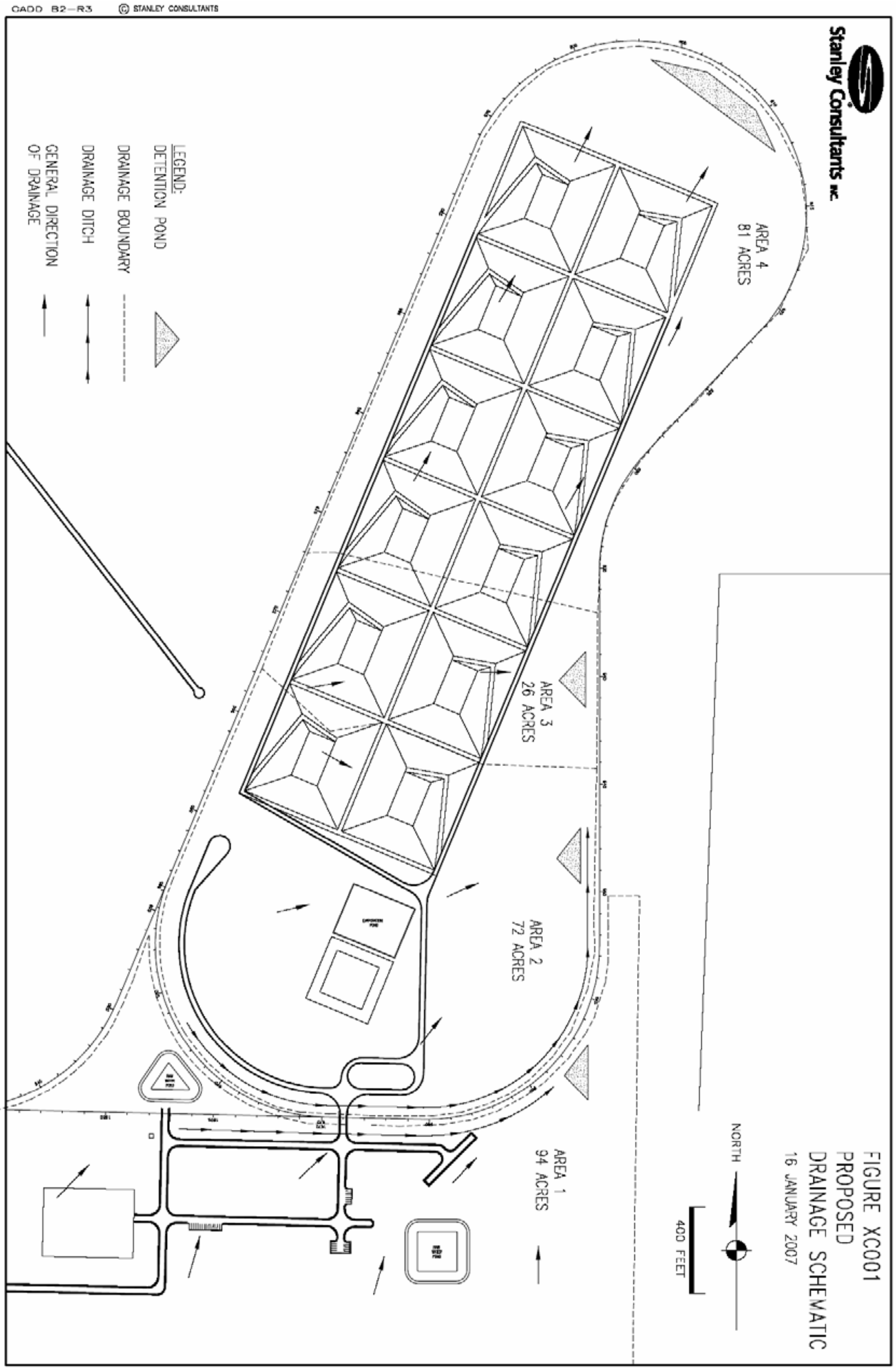


Figure 4-3. Proposed Drainage Schematic for Salem Site

from the ground, well below the water surface, and there would be no anticipated impact to the riverbank or to riverbank vegetation due to construction access or pipe placement. The pipeline would extend approximately 400 feet underwater to access the deeper portion of the reservoir.

Approximately eight vertical H-pile supports would be driven into the channel bottom as supports for the proposed pipeline. The supports would be driven to a depth to be determined during construction. The pipeline would be 20" welded steel pipe approximately 400 feet (120 m) long. A stainless steel passive intake screen would be installed on the end of the pipe. The diameter of the intake screen to be installed on the pipe extending into the river would be sized to meet the impingement velocity requirement and address Clean Water Act requirements. No measurable effects on fish, other aquatic life, or aquatic habitat are anticipated. Intake velocity of water through the intake screen would be below impingement velocity as required by 40 CFR Part 125 Subpart I (0.5 ft/sec).

The raw water supply system would consist of a collector well which would use a passive intake screen installed on the end of a lateral pipe that extends into the Morony Reservoir. The intake screen would be located and designed to prevent sediment and debris from entering the system while also providing protection to aquatic life. The passive intake would be designed according to Section 316(b) of the Clean Water Act which applies to new cooling water facilities that withdraw between two and 10 million gallons per day (mgd). The rule states that the maximum through screen intake velocity must be less than 0.5 feet per second (fps).

A reinforced, below-grade, concrete caisson (a vertical cylinder serving as a waterproof chamber or sump) would be constructed near the river and would serve as the intake's "wet well." The caisson would be located outside of the floodplain. A fully enclosed pump house would be located on the top of the caisson with a finish floor elevation at approximately grade. The pump house would contain two pumps designed to deliver a maximum of 3,200 gallons per minute (gpm) to the plant site. The pumps would deliver the water to the HGS plant site through a buried pipe approximately 2.3 miles (12,200 ft or 3,720 m) in length. The pipe would be buried at a minimum of 6.5 feet (2 m) below the ground surface.

HGS would discharge wastewater back to the City of Great Falls for disposal at its existing wastewater treatment facility via approximately 55,000 feet (16,800 m) of newly constructed 12"sanitary force main that would run from the project site to a point near Malmstrom Air Force Base where the line would intersect an existing wastewater line owned by the City of Great Falls. A third pipeline would be constructed to supply potable water to the site from the City of Great Falls. This pipeline, constructed of 6" ductile iron or HDPE, would follow the same routing as the discharge pipe, but would be located a minimum of 10 feet (3 m) to the side. This water supply pipeline would be buried at a depth of 7 feet (2.1 m).

An additional construction activity that could directly affect water resources by nature of its location includes the installation of a transmission line. The transmission line would extend south and west from the plant site, across the Missouri River north and east of Cochrane Dam and terminate at NorthWest Energy's existing Great Falls Switchyard, located north and west of Rainbow Dam. Multiple-pole or H-frame structures would probably be required at the Missouri River crossing point to maintain proper phase-to-phase and phase-to-ground clearances.

In order to protect the water quality of the Missouri River during construction activities taking place in or adjacent to the River, any and all BMPs required by the appropriate authority would be implemented and maintained. These BMPs could include such measures as the installation of double-walled silt curtain in the river surrounding construction activities and installation of silt fencing and other erosion and sediment control measures when working in the floodplain to protect all adjacent wetlands and drainage ways. Permits and authorizations that would likely be required for all construction activities in or adjacent to water bodies include: Corps 404 and Section 10 Permits; Montana DEQ 401 Certification and 318 Authorization; MFWP SPA 124 Permit; and Cascade County 310 and Floodplain permits. On March 21, 2006 SME submitted a Joint Application to county, state and federal authorities, including DEQ and the Army Corps of Engineers. On November 20, 2006 the Helena Regulatory Office of the Army Corps of Engineers' Omaha District advised SME that the proposed activity (intake structure and overhead power line crossing of the Missouri River) was authorized by Nationwide Permit 12 (Utility Line Activities).

Because construction activities in or near water bodies are so heavily regulated in Montana, the temporary impacts from construction, such as increased erosion on the river banks and increased turbidity in the water column, are anticipated to be reduced below the threshold of significance. Construction is not anticipated to significantly affect floodplains or wetlands, as in the area of impact both floodplains and wetlands are generally limited to the incised drainage habitat and narrow fringes of the river. In order to minimize impacts on waterfowl and wildlife habitat, it is likely that required permits for construction in or adjacent to the Missouri River would be limited to times when spawning, nesting, or breeding of aquatic and/or wetland species is not occurring. That would probably limit construction to late summer, fall, and winter months.

4.4.2.2 Operation

The operation of the power plant would require a large amount of water, with implications for both water supply and wastewater treatment and disposal. In the U.S., water withdrawals for thermo-electric power plants are the leading use of water and accounts for approximately 48 percent of all water withdrawals in the United States. Water withdrawals for irrigation are the second largest water user and account for approximately 34 percent of all water withdrawals (USGS, 2005).

In 2000, a total of 110 million gallons per day (123 thousand acre-feet per year) of water was withdrawn in Montana for use in thermoelectric power generation. All water used in the state for thermoelectric power is surface water. Comparatively, in the same year a total of 7,950 million gallons per day (8,920 thousand acre-feet per year) of water was withdrawn for irrigation uses in Montana, over 70 times the amount used for thermoelectric power. The amount of water withdrawn for thermoelectric uses in Montana represents 0.056 percent of the total water withdrawn in the entire nation (195,000 million gallons per day) for thermoelectric uses (USGS, 2005).

The proposed power plant would withdraw surface water required for its operation from Morony Reservoir, approximately 0.4 mile (0.6 km) upstream of Morony Dam on the Missouri River. Morony Dam is owned and operated by Pennsylvania Power & Light (PPL) Montana (Figure 2-

26). The land directly adjacent to the reservoir is also owned by PPL Montana. Morony Dam is operated as a run-of-the-river generation facility. Therefore, the outflow is maintained essentially equal to the inflow. The Morony Reservoir has a capacity of approximately 13,889 acre-feet and covers an area of approximately 304 acres (123 ha). Presently there is no public access to the Morony Reservoir for recreational purposes.

The plant would require a maximum of 3,200 gpm (7.13 cubic feet per second or 5,161 acre-feet per year) of "make-up water" to be pumped from the Morony Reservoir. The majority of this water (80 to 85 percent) would be a consumptive water use. This would represent almost five percent of all water withdrawn in the state for electrical power generation. The majority of make-up water would be used for cooling tower make-up due to the large evaporation, drift, and blowdown losses. A raw water tank would provide an on-site storage for service water and cooling tower make-up usage. A coal burning power plant is a thermoelectric plant which works by heating water in a boiler until it turns into steam. After the steam is used to spin the turbine-generator that produces electricity, it is sent to the condenser to be cooled back into water. Most of the water used in thermoelectric power generation is used in the condenser to cool the steam back into water. Then the condensed water is pumped back to the steam generator to become steam again while the cooling water is discharged as return flow or is recycled through cooling ponds or towers.

The annual mean flow of the Missouri River immediately downstream of the Morony Dam varies substantially, but is generally above 4,000 cfs. During extreme dry months, the monthly flow can drop down to 3,000 cfs. Assuming an extreme dry spell flow of 2,500 cfs for flows of the Missouri downstream of Morony Dam, the amount of withdrawal for the power plant (a maximum of 7.13 cfs) would reduce the river's flow by 0.29 percent.

This withdrawal would not in of itself significantly reduce flows in the Missouri River downstream of the site, though it would represent a small additional increment of consumptive use within the Missouri River Basin. This consumptive use of water has important implications for aquatic life, including threatened and endangered species, but is not cited by the state as the priority threat facing aquatic species in the Missouri River.

The water rights for supplying the water would be from an existing water reservation that is owned by the City of Great Falls. The city would continue to own the water reservation and would sell the water to the HGS through an agreement between the city and SME. The point of diversion for the existing water reservation is within city limits.

Consumptive Water Use

Much of the water that is withdrawn from rivers and aquifers for use by irrigated agriculture, industry and municipalities is actually returned to a watershed after being used. Often it is returned in altered form, carrying impurities like nutrients and suspended solids that can impair receiving water quality. Wastewater treatment plants endeavor to improve the quality of effluent prior to discharge so as to reduce the impact on receiving water.

In contrast, **consumptive use** is that portion of withdrawn water that is used or "locked up" and effectively removed from a watershed, like that incorporated into the tissues of growing crops. This water is sequestered, and no longer available for other uses. Consumptive use also includes water lost to a basin through diversion and evaporation, plant evapotranspiration, or conversion, or to the ground.

The point of diversion for the preferred HGS plant site is located downstream of the city in the Morony Reservoir. The city has prepared and submitted an application to the Montana Department of Natural Resources and Conservation to add a point of diversion and place of use to the existing water reservation (SME, 2005f).

The power plant would generate a maximum of 811 gpm of wastewater that must be discharged and would consist of concentrated river water and trace amounts of cooling tower water and boiler water treatment chemicals (DEQ, 2005). Best available pollution control technologies (BACT, or Best Available Control Technology) could reduce but not eliminate the chemical loading in the discharge water.

SME proposes to discharge wastewater back to the City of Great Falls for disposal and treatment at its existing wastewater treatment facility via a 12" newly constructed sanitary force main. The City of Great Falls wastewater treatment facility is licensed and permitted to treat and discharge up to 21 million gpd into the Missouri River (MPDES MT 0021920). The facility's discharge point is 1.5 miles (2.4 km) upstream of Black Eagle Falls Dam or approximately 12 river miles upstream from the proposed water intake pipe in Morony Dam Reservoir. The facility currently discharges between 9 and 10.5 million gpd. The facility thus has sufficient capacity to treat and discharge HGS' proposed 1,168,000 gpd maximum industrial and sanitary wastewater discharge. The environmental impacts from the discharge of the facility's treated wastewater were addressed during its MPDES permitting and 5-year review processes (Jacobson, 2006b).

The city's wastewater treatment facility has pretreatment requirements that must be met before it would accept any water from the power plant. Some of these requirements are summarized in the textbox below. Additionally, the city has set maximum allowable industrial loading (MAIL) numbers for heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, zinc). The loading numbers represent the total mass of each pollutant that the wastewater treatment plant can accept from all industrial sources combined. Wastewater discharged to the treatment facility from HGS would need to meet city-determined loading levels set below the MAIL values.

An Industrial Wastewater Application for Permit was submitted to the City of Great Falls on February 15, 2006 in order to allow the proposed power plant to discharge industrial wastewater as a Steam Electric Power Generating (40CFR Part 423) category of industry. A 12" forced main piping system would extend from the proposed plant and connect to the existing municipal sanitary sewer at the junction of the Highway 87 bypass and North 10th Avenue. Discharge from the plant would average 0.734 mgd (734,400 gpd) and have a maximum peak of 1.168 mgd (1,168,000 gpd). This wastewater would be generated from various plant operation sources, including boiler blowdown; cooling tower blowdown; turbine, boiler, and transformer sumps; and raw water treatment (softener, RO backwash).

A 5.8-million gallon basin would be constructed onsite in order to provide surge control and a limited amount of primary sedimentation for boiler blowdown, cooling tower blowdown, and sump discharges from turbine, boiler and transformer areas. The sump discharges would undergo treatment prior to entering the basin in a standard oil/water separator unit. No toxic organic compounds would be present in the discharged wastewater. SME would install

wastewater sampling and monitoring equipment as per the requirements of the city. Among several compounds, trace amounts of the heavy metals arsenic, copper, zinc are expected to be present in the wastewater discharged from the plant. There is a possibility that extremely low concentrations of lead and mercury may also be present in the discharged wastewater. However, the concentration of all regulated compounds in the power plant waste stream would be well below (typically between 1 and 10 percent of) the maximum allowable discharge concentrations.

Highwood Generating Station Requirements under the Industrial Pretreatment Program:

- At least 180 days prior to discharging industrial wastes, submittal of a Disclosure Form and Permit Application. Process schematics and site plans shall be included in the application.
- Process water and domestic wastewater must be separated. Domestic wastewater shall not be discharged though the monitoring facilities.
- Highwood Station would need to install sampling facilities for process wastewater discharge. The sampling facilities must include:
    - An automatic sampler capable of collecting flow-proportioned composite samples.
    - A flow meter with totalizer that would enable daily and monthly flow totals to be determined.
    - The sample point must be such that the sample gathered by the automatic sampler is representative of the discharge of process wastewater being regulated.
    - The ability to collect grab samples of process wastewater representative of the flow at the time of sampling.
    - Reasonable access to the sampling facilities by the City of Great Falls personnel or representatives.
    - A properly calibrated open-channel type flow meter.
- A Spill Prevention Control and Countermeasure Plan.
- Secondary Containment must be provided for hazardous chemicals. Chemicals stored in containers larger than 55 gallons would probably require secondary containment depending on the degree of hazard. Storage of low-hazard chemicals in 55 gallon and smaller containers (not in use) should be in an area with no floor drain. 55 gallon and smaller containers of non-hazardous chemicals that are in use may be located at the point of application.
- Storm drainage and roof drains must not discharge into the sanitary sewer.
- Highwood Station must obtain a storm water discharge permit from the Montana Department of Environmental Quality if so required by that agency.
- Highwood Station would meet all requirements of OCCGF, particularly 13.14 and 13.20.
- Highwood Station would meet all requirements of 40CFR Part 423 as it applies to Pretreatment Standards for New Sources.
- Highwood Station would be responsible for sampling, analyzing and reporting results of sampling activity to the city. The city would also collect samples of process wastewater discharge.
- Dilution of process wastewater for the purpose of lowering pollutant concentrations would not be allowed.

Source: City of Great Falls, Water/Wastewater Treatment Plant

Other important sources of impacts associated with operations of the plant include site runoff and leaching. Runoff specifically from the coal piles on site would be directed to a dedicated, zero outflow evaporation pond. This pond would have a footprint of 3.5 acres (1.4 ha) and capacity of 12 acre-feet and is labeled Loop Pond in the proposed drainage schematic above (Figure 4-3). The ash disposal areas and the waste monofill would be located inside the southern area of the rail road loop. The ash disposal area would be constructed to include ponding areas to collect runoff from precipitation events. These containment areas would serve as evaporation ponds and would have zero discharge.

While leaching of coal and other site runoff, and the percolation of wastes into the groundwater, is an inherent concern to water resources, the clays found onsite are characterized by very slow water transmission rates and infiltration rates. These soils should serve as efficient cell and detention pond basin liners, and groundwater below the site would be monitored on a regular basis to ensure no contamination is occurring. If any contamination is detected by means of groundwater wells or other methods, SME would be required to conduct cleanup procedures in accordance with a DEQ-approved Solid Waste Management Plan and a site-specific SPCCP.

4.4.3 ALTERNATIVE SITE – INDUSTRIAL PARK

4.4.3.1 Construction

Construction activities at the Industrial Park Site and Best Management Practices (BMPs) employed to reduce the impacts associated with construction activities, would be very similar to the Salem site. The total area of disturbance for these activities at the Industrial Park Site would include the total footprint of the power plant, approximately 300 acres (121 ha), a water intake structure and associated pipelines, and additional roadway, rail spur, transmission lines, and utility corridor zones.

Though a storm water management plan has not been developed for the Industrial Park Site, the facility would be required to completely manage all storm water, to ensure that runoff from the construction areas would be minimized. Direct impacts to water resources from construction activities include the construction of the water intake structure in the Morony Pool and the installation of transmission line and pipeline within floodplain and wetland areas of the Missouri River.

A 4.5-mile (7.2-km) pipeline (compared to less than two miles (3.2 km) for the Salem site) would be needed to transport make-up water from an intake structure on the Missouri River downstream of the City of Great Falls to the plant. Insofar as this pipeline would be installed in an area of wetland, waters of the U.S., and/or floodplain, the temporary, minor impacts associated with riparian habitat disturbance would be commensurate with those at the Salem site.

If the Industrial Park site were to be chosen as the location of the power plant, it could be annexed into the city (please see relevant discussion under the Farmland/Land Use, Section 4.12). Both industrial and municipal wastewater generated from the plant would then be discharged back to the City of Great Falls for disposal at its existing wastewater treatment facility. Potable water would be supplied to the plant from the city's water treatment plant. The city municipal sewer and water lines currently run to the IMC plant, located approximately one half-mile (0.8 km) southwest of the site and SME would tap into those lines.

In order to protect the water quality of the Missouri River during construction activities taking place in or adjacent to the river, SME would be required to implement and maintain any and all BMPs required by the appropriate authority would be implemented and maintained. These BMPs would be similar to the ones required for the Salem site, and could include such measures as the installation of double-walled silt curtain in the river surrounding construction activities

and installation of silt fencing and other erosion and sediment control measures when working in the floodplain to protect all adjacent wetlands and drainage ways.

Because construction activities in or near water bodies are so heavily regulated in Montana, the temporary impacts from construction, such as increased erosion on the river banks and increased turbidity in the water column, are anticipated to be reduced to below the threshold of significance. The construction is not anticipated to significantly affect floodplains or wetlands, as in the area of impact both floodplains and wetlands are generally limited to the incised drainage habitat and narrow fringes of the river. In order to minimize impacts on waterfowl and wildlife habitat, permitting would likely limit construction in or adjacent to the river to times when spawning, nesting, or breeding of aquatic and/or wetland species is not occurring.

4.4.3.2 Operation

The operation of the power plant at the Industrial Park site would be almost identical to the operation of the plant at the Salem site, with similar implications for water resources. The site would have the same requirements for water withdrawals from the Missouri River, and would also withdraw water from the Morony Reservoir. However, since the Salem site is located south of the river and the Industrial Park site north of it, the water intake structure would be placed on the opposite side.

The withdrawal of Missouri River water for plant operations would not significantly reduce flows in the Missouri River downstream of the site, though it would represent an additional increment of consumptive use within the Missouri River Basin. The water rights for supplying the water would be from an existing water reservation that is owned by the City of Great Falls.

The power plant would generate industrial wastewater that would not be consumptively used and would instead require discharge. A maximum of 811 gallons per minute of wastewater would be discharged to the City of Great Falls wastewater treatment plant. The discharged water would consist of concentrated river water and trace amounts of cooling tower water and boiler water treatment chemicals (DEQ, 2005). The city's wastewater treatment facility would require pretreatment standards to be met before it would accept any water from the power plant, as described under the Proposed Action.

Other important sources of impacts associated with operations of the plant include site runoff and leaching. Runoff from the site would be contained in zero outflow evaporation ponds. Ash generated from the burning of coal would be disposed of off site, eliminating the risk of leaching from an onsite waste monofill. The risks of leaching at any off-site disposal facility are unknown and site-dependent. Use of the High Plains Landfill would result in impacts similar to that of the Salem site given the similarities in bedrock (WMA, 1995). Although the leaching of coal and other site runoff could be a concern to water resources, the clays found onsite are characterized by very slow water transmission rates and infiltration rates. These soils should serve as effective detention pond basin liners, and groundwater in the vicinity of the site would be monitored on a regular basis to ensure no contamination is occurring. If any contamination is detected, SME would be required to follow cleanup procedures in accordance with a DEQ-approved Solid Waste Management Plan and a site-specific SPCCP.

4.4.4 CONCLUSION

The No Action Alternative would not significantly, adversely affect water resources at or near the Salem site or the Industrial Park. However, negligible to minor, long-term adverse impacts would continue from existing agricultural land uses. Continuing agricultural practices such as grazing, plowing, disking, harvesting, fertilizing, and using pesticides on the Salem or Industrial Park sites would contribute incrementally to a minute extent to sedimentation and nutrient loadings of the Missouri River.

Because SME would need to meet its energy supply needs by purchasing power from generation sources located elsewhere, SME could potentially contribute indirectly to ongoing water resource impacts at different generating stations in the region or at potentially new generating stations located outside of the region.

The proposed construction and operation of the power plant and wind turbines at the Salem site would create several potential impacts to water resources. The construction of the site could involve general impacts such as increased storm water runoff carrying sediment and contamination loads into surface water, and contamination from construction equipment and activities infiltrating area soils and potentially percolating down into the groundwater.

Potential direct impacts to water resources from construction activities would include the construction of the water intake structure in the Morony Reservoir and the installation of transmission lines and pipelines within the watershed of the Missouri River and tributaries.

There would be a minimal loss of non-jurisdictional wetlands from these actions, and water quality of the Missouri River would be protected by any and all BMPs required by the appropriate authority and permitting agency. Because construction activities in or near water bodies are so heavily regulated in Montana, the impacts from construction would be substantially reduced from what they otherwise could be in the absence of regulation. Required authorizations and permits reduce water resource impacts from the construction of the power plant to be of moderate magnitude, medium term duration, and medium extent, and have a probable likelihood of occurring. The overall rating for impacts on water resources from the construction phase of the power plant would be adverse and non-significant.

Operation of the power plant at the Salem site would involve water withdrawals from the Missouri River, which would reduce the river by 0.31 percent in a “worse-case scenario”. Though it would represent an additional increment of consumptive use within the Missouri River Basin, it is not in of itself a significant reduction in the Missouri River flows downstream of the site. The power plant would discharge a maximum of 811 gal/minute of wastewater. The operation of the power plant would result in impacts that would be of minor magnitude, long term duration, and medium extent, and have a probable likelihood of occurring. The overall rating for impacts on water resources from the operation phase of the power plant would be adverse and non-significant.

The construction and operation of the power plant at the Industrial Park site would involve similar activities and create many of the same impacts to water resources as the Proposed Action.

Impacts associated with the installation of the longer water intake pipeline would be comparable to those of the Proposed Action: temporary disturbance of non-jurisdictional wetland, and no direct effluent discharges to the Missouri River. At the Industrial Park site, SME would also hook up to city sewer and water lines. While this likelihood would make it easier for SME to manage its water resources, it does not change the impact of net water consumption amounts or water quality parameters that would be regulated and required at the plant. In other words, regardless of the alternative, the power plant operators would have to obtain and adhere to all local, state, and federal regulations, which would prevent any significant impacts from occurring to water resources.

The construction and operation of the power plant at the Industrial site, then, would have similar impacts as at the Salem site. The associated activities would result in impacts that would be of minor magnitude, long term duration, and medium extent, and have a probable likelihood of occurring. Overall, the rating for impacts at the Industrial Park would also be adverse and non-significant.

4.4.5 MITIGATION MEASURES

The implementation of any and all BMPs required by appropriate permitting authorities would reduce the impacts to water resources associated with both the construction and operation of a coal-burning power plant. These BMPs could include such measures as the installation of double-walled silt curtain in the river surrounding construction activities and installation of silt fencing and other erosion and sediment control measures when working in the floodplain to protect all adjacent wetlands and drainage ways. Permits and authorizations that would likely be required for construction and operation activities include: Corps 404 and Section 10 Permits; Montana DEQ 401 Certification and 318 Authorization; Montana FWP SPA 124 Permit; and Cascade County 310 and Floodplain permits.

Depending on permitting requirements, construction activities in or adjacent to the Missouri River may be limited to times when spawning, nesting, or breeding of aquatic and/or wetland species is not occurring. Additionally, during plant operations at the Salem site, groundwater would be voluntarily monitored in the vicinity of the waste monofill in order to detect any possible contamination.

4.5 AIR QUALITY

4.5.1 NO ACTION ALTERNATIVE

The No Action Alternative would not contribute directly to air emissions or air pollution at either the Salem or Industrial Park sites. However, it would require that other power generation facilities increase, or expand production, to meet SME's demand for power. The impact of the consequent changes on air quality cannot be determined, because this would depend on the mix of energy sources used to generate SME's power, which is unknown. The discussions in Chapter 2 of this EIS describe the wide ranges in air emissions from various energy sources.

Under the No Action Alternative, air pollutant emissions and impacts to ambient air quality from meeting SME's projected electricity load would not simply "go away," but would be located in different places and occur to different degrees, depending on the energy source or mix of energy sources used to generate the electricity sold to SME. This uncertainty makes it impossible to predict, for example, whether emissions of mercury and greenhouse gases would be equal to, lower, or higher than those expected from the HGS.

4.5.2 Proposed Action – HGS at the Salem site

4.5.2.1 Construction

Heavy equipment needed to build the power plant or any other heavy industrial facility would likely include, at a minimum, graders, bulldozers, backhoes, dump trucks, cement trucks, cranes and other diesel and gasoline-fueled heavy and light equipment. Intermittently, over a period of several years, this equipment would emit quantities of five criteria air pollutants: carbon monoxide (CO), nitrogen oxides (NOx), sulfur dioxide (SO_2), particulate matter (PM_{10}), and volatile organic compounds (VOCs). In addition to tailpipe emissions from heavy equipment, the temporary disturbance of several hundred acres of ground surface during excavation and grading activities to prepare the site for construction potentially could generate fugitive dust.

Construction personnel would be required to implement reasonable measures, such as applying surfactant chemicals or water to exposed surfaces or stockpiles of dirt, when windy and/or dry conditions promote problematic fugitive dust emissions. However, mines in windy areas have found that chemical surfactants do not work well. The area around Great Falls is fairly windy. High winds would peel off the treated layer, exposing dry soil or gravel beneath. Some form of soil pavement treatment might be a better solution in a windy area where equipment is in use. Adhering to these would minimize any fugitive dust emissions. Use of one or more of these mitigation measures, in addition to the fact that there are few nearby residents, would reduce the possibility of adverse impacts from fugitive dust emissions to below the level of significance.

Exhaust emissions from equipment used in construction, coupled with likely fugitive dust emissions, could cause minor to moderate, short-term degradation of local air quality, but would not be high enough to result in significant deterioration.

4.5.2.2 Operation

4.5.2.2.1 Emissions and Compliance with Regulatory Standards

The primary source of emissions from the plant would be the combustion byproducts of the CFB boiler. The combustion of coal in the boiler generates hot gases, which, in turn, generate steam. The steam powers a steam turbine that turns a generator to produce electricity. In addition to the CFB boiler, air pollutants would be emitted from the following equipment:

- Auxiliary boiler
- Coal thawing shed heater
- Building heaters
- Emergency generator and fire water pump
- Refractory brick curing heaters
- Material handling equipment and storage areas
- Cooling tower
- Fuel storage tank
- General vehicle travel

As described in Section 3.3.1, under the federal Clean Air Act (CAA), states are given the primary authority to manage their air quality resources. Compliance with applicable air regulatory programs would serve to mitigate impacts of HGS air emissions sources as described in the following sections.

Regulatory Programs

As described in Section 3.3.1, under the federal Clean Air Act (CAA), states are given the primary authority to manage their air quality resources. EPA requires air pollution control agencies such as DEQ to develop State Implementation Plans (SIPs), which are control plans based on federal statutes and regulations. The Montana SIP generally establishes limits or work practice standards to minimize emissions of the criteria air pollutants or their precursors. Among other requirements, air quality management in Montana's SIP includes general state emission standards, federal New Source Performance Standards (NSPS), hazardous air pollutant (HAP) regulations, federal Acid Rain Program requirements, the federal Title V operating permit program, and the Prevention of Significant Deterioration (PSD) permitting program. The proposed generating station would be required to comply with the requirements of each of these air quality programs.

The general state standards set the most basic level of air quality control for criteria pollutants, and cover all regulated sources in the state of Montana. These standards include a solid fuel sulfur content limitation, particulate limits for fuel burning sources based on the heat input of the source, particulate emission limits for other sources based on the weight of material processed, and limits on the opacity of visible emissions. Montana also has liquid and gaseous fuel sulfur content limits which would apply to the use of fuel oil for startup of the CFB and the fuel/gas firing of the auxiliary boiler and building heaters.

The NSPS set more stringent requirements for equipment that has been newly constructed, reconstructed, or modified since the standards were put into effect. While NSPS have historically applied only to newly constructed, reconstructed, or modified equipment, the recently promulgated NSPS, 40 CFR 60, Subpart HHHH, "Emission Guidelines and Compliance Times for Coal-Fired Electric Steam Generating Units," is applicable to certain existing emission units. The primary purpose of the NSPS program is to achieve long-term emissions reductions by assuring that the best demonstrated emission control technologies are installed as the industrial infrastructure is modernized. The specific applicability of the NSPS program upon the generating station equipment is discussed further below.

The National Emission Standards for Hazardous Air Pollutants (NESHAP) program establishes standards for certain industrial source categories for the emission of HAPs, otherwise known as the Maximum Achievable Control Technology (MACT) standards. The MACT standards can apply to existing and newly constructed or reconstructed source categories. The specific applicability of the NESHAP program upon the generating station equipment is discussed further below.

The federal Acid Rain Program is a national regulatory program applicable to certain emission units that burn fossil fuels and produce and sell electricity. The program is focused on the

reduction of NO_x and SO_2 emissions from these sources. The emissions of SO_2 are regulated and reduced through a national cap-and-trade program where SO_2 "allowances" are bought and sold on a market. The NO_x emission reductions are achieved through specific NO_x emission limits placed upon certain coal-fired utility boilers that are subject to the program. The specific applicability of the Acid Rain program upon the proposed generating station is discussed further below.

The Title V Air Operating Permit program is administered by DEQ and requires "major sources" of regulated air pollutants to obtain an operating permit that provides the required monitoring, record keeping, reporting, and compliance certification requirements necessary for the on-going operation of the plant. An operating permit application has already been submitted for the proposed project and an operating permit is expected to be issued for the plant prior to operation.

Pursuant to DEQ rules (ARM 17.8.1211(4)), sources that are required to develop and submit a Risk Management Plan (RMP) pursuant to section 112(r) of the federal Clean Air Act, are required to register such a plan. The only expected equipment to be installed that may be subject to RMP requirements is the ammonia storage tank associated with the selective non-catalytic reduction (SNCR) control system to be installed on the CFB boiler. However, this program is not triggered for aqueous ammonia storage if the quantity stored is less than 20,000 lbs at a concentration of 20 percent or greater. If the concentration of aqueous ammonia is less than 20 percent, regardless of quantity, the storage of the ammonia would not be subject to RMP (40 CFR §68.130(a) and 40 CFR §68.115(b)(1)). Before the ammonia could be brought on-site, either the inapplicability of the RMP program would need to be documented or an RMP would need to be developed and submitted.

The PSD permitting program is a federally required permitting program administered by DEQ that involves the review of proposed new and modified major air pollution sources. This review is comprised of two main parts –

- A review of ambient air impacts upon the immediately surrounding area (referred to as a Class II area) and on more distant areas in the region that are designated as environmentally sensitive Class I areas;

- An assessment of the air pollution control technologies proposed by the source to ensure that the Best Available Control Technology (BACT) is installed for each criteria pollutant.

Appendix I contains the DEQ's supplemental preliminary determination on the PSD air quality permit for SME-HGS (DEQ, 2006a), which was subject to public comment along with the DEIS. The ambient air quality review is discussed in detail later in this section.

In addition to BACT for criteria pollutants required under PSD, the DEQ requires a BACT review for all pollutants of concern, including HAPs, as part of the pre-construction permitting.

The following subsections discuss how the requirements of these air quality programs would be addressed for the HGS.

CFB Boiler

The CFB boiler would be subject to the NSPS standard for electric utility steam generating units (Subpart Da), and would be capable of meeting the limits provided in this subpart for visible emissions (opacity), PM, SO_2, NOx, and Hg. EPA updated the current NSPS Subpart Da requirements on February 27, 2006. This updated NSPS Subpart Da applies to any electric utility steam generating unit (>250 MMBtu/hr heat input) that is newly constructed, modified, or reconstructed after the proposal date of the updated NSPS (February 28, 2005). The NSPS Da update sets new emission limitations on PM, SO_2, and NOx. The CFB boiler is required to meet these updated NSPS Da emissions limits.

The CFB boiler would be subject to the promulgated Clean Air Mercury Rule (NSPS Subpart HHHH – Emission Guidelines and Compliance Times for Coal-Fired Electric Steam Generating Units), which allocates mercury budgets to every state. Under the federal mercury program (known as the "model rule"), mercury emission allowances are then distributed to coal-fired electric utility units. Under the model rule, these allowances may be bought and sold through a trading program administered by the EPA. The federal mercury reduction program will go into effect in 2010. It is important to note that NSPS Subpart HHHH requires states to update their SIPs to reflect how the mercury rule would be implemented. The individual states have the flexibility to develop their own mercury reduction program that is different from the EPA's "model rule." However, regardless of what type of program is used, the state is required to meet the EPA determined state mercury budget.

The state of Montana has adopted its final rules on mercury emissions from coal-fired electrical generating units and the rules became effective on October 27, 2006. The Montana mercury standard is more stringent than the federal rule and is on a pound per trillion Btu (lb/TBtu) basis. The CFB boiler of the HGS would be subject to the requirements of the final mercury rule adopted in Montana.

The Acid Rain Program also would be applicable to the proposed CFB boiler. In order to comply with the program, the following steps would be required –

- Necessary SO_2 allowances would need to be obtained
- Applicable NO_x limitations would need to be complied with
- Required continuous monitoring, record keeping, and reporting would need to be followed

As part of the air quality permit application for HGS, a BACT review has been conducted by DEQ for the CFB boiler for the following pollutants: SO_2, NO_x, PM/PM_{10}, VOC, CO, sulfuric acid mist, lead, mercury, acid gasses (HCl and HF), and radionuclides. The conclusions of the BACT analysis were that the following control technologies would need to be implemented (Table 4-2). Each chosen technology would reduce emissions to levels that would meet or exceed the level of control required by all general state standards and NSPS requirements.

Table 4-2. BACT Summary for CFB Boiler

Pollutant	Selected BACT Control Technology
Filterable PM/PM_{10}	Fabric Filter Baghouse
SO_2	CFB Design, Low-Sulfur Coal, and Hydrated Ash Reinjection
NO_x	CFB Design with Selective Non-Catalytic Reduction
VOC	Proper Design and Combustion
CO	Proper Design and Combustion
Sulfuric Acid Mist, Acid Gases, Trace Metals, and Condensable PM/PM_{10}	CFB Design, Low-Sulfur Coal, Hydrated Ash Reinjection, and Fabric Filter Baghouse
Mercury (Hg)	IECS and, if necessary, ACI or equivalent
Radionuclides	Fabric Filter Baghouse

Control of filterable particulate (PM/PM_{10}) emissions from the CFB boiler would be accomplished through the use of a fabric filter baghouse. In this device, exhaust from the boiler would pass through rows of fabric filter bags. The exhaust gases pass through the bags, while the filterable particulate remains on the upstream face of the bags.

SO_2 emissions in the boiler result from the sulfur present as an impurity in the coal that is fired. The CFB boiler primarily would fire low-sulfur, sub-bituminous coal from the Powder River Basin. This coal varies in sulfur content, but is expected to typically have sulfur contents below one percent by weight. The design of the CFB boiler employs the firing of crushed coal mixed with limestone injected into the combustor. The use of limestone provides control of SO_2 by reacting with SO_2 to form calcium sulfate ($CaSO_4$), which can be removed from the exhaust in the fabric filter baghouse. In addition to this boiler design, the boiler would be equipped with a hydrated ash reinjection system that would take a portion of the limestone and ash collected in the fabric filter baghouse, hydrate it, and re-introduce it into the exhaust in a reaction vessel upstream of the fabric filter baghouse. Hydrated ash reinjection is a type of dry flue gas desulfurization (FGD) system that allows for additional conversion of SO_2 to $CaSO_4$. Overall, the use of limestone injection with hydrated ash reinjection would control 97 percent of the SO_2 emissions that would result from an uncontrolled boiler firing low-sulfur coal.

Emissions of NO_x from the boiler would be formed in two ways: thermal NO_x would be formed from the oxidation of nitrogen gas (present in the air fed to the boiler) at very high temperatures, and fuel NO_x would be formed from the oxidation of nitrogen that is bound in the coal fired in the boiler. The CFB boiler design has approximately 80 percent lower NO_x emissions than a comparably sized traditional pulverized coal boiler design. The lower emissions are due to the inherently lower flame temperature of the CFB boiler design, which helps minimize formation of thermal NO_x. The CFB NO_x emissions would be controlled through the use of a selective non-catalytic reduction (SNCR) system. This technology involves the decomposition of NO_x to nitrogen (N_2) and water. This is accomplished by injecting ammonia (NH_4) or urea ($CO(NH_2)_2$) into a high-temperature area of the furnace. The ammonia or urea reacts with the nitric oxide (NO) in the exhaust gas and reduces it to nitrogen and water. A byproduct of this technology is an increase in ammonia emissions (sometimes referred to as "ammonia slip"), resulting from a portion of the injected ammonia that does not react with the NO_x. Applying SNCR technology

to the exhaust reduces NO_x emissions by an additional 50 percent beyond the control already provided by the CFB boiler design, for an overall reduction of 90 percent of NO_x emissions.

CO and VOC emissions from the CFB boiler would be controlled through proper design and combustion in the boiler. Add-on controls such as catalytic and thermal oxidation systems have been evaluated by DEQ as part of the proposed generating station's PSD permit application, but were determined to be infeasible due to the high expense and impracticality of reheating the exhaust gas to a temperature where those controls could be effective.

Though a BACT review for HAPs is not required under the federal CAA provisions, SME has conducted a BACT evaluation of HAPs from the CFB boiler per the request of DEQ pursuant to Montana's general air quality permit rules in 17.8.740 *et seq*. Sulfuric acid (H_2SO_4) mist, acid gases (primarily hydrofluoric acid (HF) and hydrochloric acid (HCl)), trace metals (including lead), and condensable PM_{10} would be emitted from the boiler. These pollutants form as a result of combustion conditions of the boiler and impurities in the coal. Emissions of these pollutants would be minimized through the use of the CFB boiler design, the hydrated ash reinjection system, and the fabric filter baghouse. Mercury emissions result from mercury present in the coal fired in the boiler. Control of mercury emissions is addressed under Section 4.5.2.2.4. Radionuclide emissions result from trace amounts of radioactive material that is present in coal and nearly all natural materials. The use of the fabric filter baghouse for particulate control represents BACT for radionuclides, as it would reduce radionuclide emissions from the CFB boiler by more than 90 percent.

Auxiliary Combustion Devices (Auxiliary Boiler, Emergency Generator, Emergency Fire Water Pump, Coal Thawing Shed Heater, Refractory Brick Curing Heaters, and Building Heaters)

The auxiliary boiler would be subject to the NSPS for industrial, institutional, and commercial steam generating units (Subpart Db), which establishes emission limits for visible emissions (opacity), PM, SO_2, and NO_x. Given that the auxiliary boiler would operate for a limited amount of time and would fire fuel oil, the applicability of NSPS emission limits is limited. EPA has updated NSPS Subpart Db on February 27, 2006. The updated NSPS Subpart Db applies to any steam generating unit (>100 MMBtu/hr heat input) that is newly constructed, modified, or reconstructed after the proposal date of the updated NSPS (February 28, 2005). The NSPS Db update sets more stringent emission limitations on PM than exist under the current rules. This updated PM limit would not be applicable to the auxiliary boiler given that no solid fuels (e.g. coal) would be fired.

The propane-fired building heaters would not be subject to a NSPS given that each unit is less than 10 MMBtu/hr. The only potentially applicable NSPS (NSPS Subpart Dc) applies to any steam generating unit >10 MMBtu/hr and < 100 MMBtu/hr heat input.

The EPA has proposed NSPS Subpart IIII (Standards of Performance for Stationary Compression Ignition Internal Combustion Engines) that applies to all owners or operators of stationary compression ignition (CI) internal combustion engines (ICE) for which construction, modification or reconstruction commences after July 11, 2005. This NSPS may be applicable to

either the emergency fire water pump or emergency generator. Any applicable requirement of this NSPS, if promulgated as a final rule, would need to be met for these engines.

Two potentially applicable MACT standards that have been promulgated for these types of combustion emission units include the following:

- 40 CFR 63, Subpart ZZZZ (National Emissions Standard for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE)) (Emergency Generator)
- 40 CFR 63, Subpart DDDDD (National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters) (Auxiliary Boiler)

Even though the emergency fire water pump would be operated with a RICE, the engine would be exempt from 40 CFR 63, Subpart ZZZZ given that the engine is less than 500 horsepower. The emergency generator would be operated with a RICE, but would be classified as an "emergency stationary RICE" and, therefore, subject only to the initial notification requirements of the standard.

The auxiliary boiler would fire only liquid or gaseous fuels and operate less than 10 percent of the year. Therefore, the boiler would be considered in the "limited use liquid fuel subcategory" of 40 CFR 63, Subpart DDDDD. New "limited use liquid fuel subcategory" boilers are subject to certain emission limits and other requirements of this standard including a particulate matter, HCl, and CO limit.

The building heaters would fire only gaseous fuels and the heat input of each heater would be less than 10 MMBtu/hr. Therefore, these heaters would be considered to be in the "small gaseous fuel subcategory" of 40 CFR 63 Subpart DDDDD. New "small gaseous fuel subcategory" boilers are subject only to the initial notification requirements of the standard.

A BACT review has been conducted by DEQ for each of the auxiliary combustion devices for the following pollutants: SO_2, NO_x, PM/PM_{10}, VOC, and CO. Each of these devices would be subject to annual limits on operation that would result in reduced annual emissions.

- The auxiliary boiler would operate only during startup, shutdown, and commissioning of the CFB boiler, and to keep the CFB boiler warm during shutdown, for a maximum of 850 hours of operation per year.
- The emergency generator and emergency fire pump would operate only in emergencies and for required maintenance, for a maximum of 500 hours of operation per year each. The coal thawing shed heater would operate only when coal needs to be thawed, for a maximum of 240 hours of operation per year.
- Because the auxiliary combustion devices would have limited hours of operation (and therefore, have low annual emissions), many add-on controls would not be cost effective.

The conclusions of the BACT analysis were that the following control technologies would be implemented (Table 4-3). Each chosen technology would reduce emissions to levels that would meet or exceed the level of control required by all general state standards and NSPS requirements.

Table 4-3. BACT Summary for Auxiliary Combustion Devices

Pollutant	Selected BACT Control Technology
PM/PM_{10}	Process Limitations Including Limited Hours of Operation
SO_2	Low Sulfur Fuels and Process Limitations Including Limited Hours of Operation
NO_x	Auxiliary Boiler: Dry Low-NO_x Burner Technology with Process Limitations Including Limited Hours of Operation Others: Process Limitations Including Limited Hours of Operation
VOC	Proper Combustion Design with Process Limitations Including Limited Hours of Operation
CO	Proper Combustion Design with Process Limitations Including Limited Hours of Operation

The dry low-NO_x burner (DLN) technology that would be used on the auxiliary boiler would reduce NO_x emissions from the boiler by 40 to 60 percent compared with conventional burners.

Material Handling and Storage

The coal, limestone, and ash material handling sources would consist of material transfer points, and would be located at conveyor transfer points, railcar and truck unloading sites, storage silos, the coal crusher, and material storage piles and bunkers.

Coal drying, cleaning, conveying, processing, storage, and transfer equipment at the site would be subject to the NSPS standard for Coal Preparation Plants, Subpart Y. This regulation sets a visible emission limit of less than 20 percent opacity for subject equipment. Equipment subject to this regulation would comply through the use of water spray and enclosures (emergency coal pile, with associated reclaim hoppers and belt feeder), and with baghouse controls (remaining subject equipment).

Limestone crushing, conveying, and transfer equipment at the site would be subject to the NSPS standard for Nonmetallic Mineral Processing, Subpart OOO. This regulation sets a visible emission limit of seven percent opacity, and a particulate emission limitation of 0.022 grains per dry standard cubic feet (a grain is 1/7000 of a pound) for subject equipment. Limestone processing equipment subject to this regulation would comply through the use of an enclosure with a baghouse.

A BACT review for particulate emissions was conducted by DEQ for each of the material handling sources. The resulting controls for all coal, limestone and ash conveyors would be partial or full enclosures. Coal and limestone belt conveyors would be partially enclosed with a

cover that extends past the conveyor belt, or is fully contained within a building. The limestone bucket elevator conveyors and ash handling pneumatic conveyors would be fully enclosed. On almost all material transfer emission points, SME would use enclosures with a baghouse or bin vent controls, which would reduce particulate emissions by 99.5 percent. Transfer points at the emergency coal pile, reclaim hoppers, belt feeder, and associated conveyor would be controlled with complete enclosure. The fly ash and bed ash conveyor and transfer emission points would be controlled with a wet dust suppression system.

The material storage areas were also evaluated by DEQ for BACT. The material to be stored on-site includes coal, limestone, fly ash, and bed ash. The proposed BACT controls for these storage areas were determined to be the use of a combination of enclosures (e.g. silos) with bin vent or baghouse control (for the active storage of coal, limestone, and ash) and reasonable precautions (for the emergency coal and ash storage areas). Reasonable precautions include compaction of storage piles and application of dust suppressants as necessary.

Cooling Tower

A wet cooling tower, with a design circulating water rate of 2,250 gallons per minute, would be used to dissipate heat from the power plant system. The proposed cooling tower would be an induced draft, counter-flow design. Cooling towers are a source of PM emissions given that a certain amount of cooling water becomes entrained in the air stream and is emitted from the tower as water droplets (known as "drift"). When the droplets evaporate, dissolved solids in the water crystallize and become PM emissions.

The most common method of reducing PM emissions from a cooling tower is with the use of a drift eliminator that removes water droplets prior to being emitted from the tower. Different types of drift eliminators have different associated control efficiencies. The cooling tower was evaluated for BACT and DEQ determined that a high efficiency drift eliminator (0.002% of the circulating water flow) constitutes BACT.

4.5.2.2.2 Impacts on Air Quality in Class II Areas

SME has submitted a PSD permit application to DEQ for the construction of a coal-fired, steam-electric generating station located near Great Falls, Montana, the aforementioned Highwood Generating Station (HGS). The proposed site is approximately eight miles (13 kilometers) east of Great Falls, Montana and approximately two miles (3.2 km) southeast of the Morony Dam, which is located on the Missouri River. The Universal Transverse Mercator (UTM) coordinates of the CFB stack are X-UTM - 497,297 m and Y-UTM - 5,266,363 m. The site elevation is approximately 3,310 feet (1,009 m) above mean sea level.

Prevention of Significant Deterioration Review

Part C of Title I of the federal CAA and ARM 17.8.801 *et seq* include preconstruction permitting requirements for new and modified major sources under the PSD program. The PSD regulations apply to new major stationary sources and modifications at existing major sources undergoing

construction in areas designated as attainment or unclassifiable, under Section 107 of the 1990 Clean Air Act Amendments (CAAA), for any criteria pollutant (42 USC 7407).

An electric generating unit is one of the 28 listed source categories (fossil fuel-fired steam electric plants of more than 250 million Btu/hr heat input) that are considered major sources under the PSD program if they have the potential to emit 100 tons per year (tpy) or more of at least one criteria pollutant. Since HGS would be a new plant, a PSD permit is required for the plant if the potential to emit for at least one criteria pollutant is 100 tpy or more. The PSD application must include review each pollutant with potential emissions above the PSD significant emission rates (SERs). The potential emissions for each criteria pollutant expected to be emitted from the operation of the HGS plant were estimated in Section 3 of the PSD Application (Table 3.1-1: Facility-Wide Potential Annual Emissions Summary of Criteria Pollutants). The PSD SERs and a summary of the proposed plant PTEs are listed in Table 4-4. The plant requires PSD review for NOx, SO_2, CO, PM and PM_{10}. There are no longer any applicable air quality standards for PM so the analyses conducted for PM_{10} address PM.

Table 4-4. PSD Significant Emission Rates

	NO_x (tpy)	SO_2 (tpy)	CO (tpy)	VOC (tpy)	PM (tpy)	PM_{10} (tpy)	Pb (tpy)
PSD Significant Emission Rate	40.0	40.0	100.0	40.0	25.0	15.0	0.6
HGS Potential to Emit	944	443	1177	38.0	376	366	0.28
PSD Review Required	Yes	Yes	Yes	No	Yes	Yes	No

Criteria Pollutant Emissions

HGS would include the operation of the following types of emission sources:

- Circulating Fluidized Bed (CFB) Boiler
- Auxiliary Boiler
- Emergency Generator
- Emergency Fire Pump
- Coal Thawing Shed Heater
- Coal Railcar Unloading
- Coal Silos
- Coal Crusher
- Silos
- Bin Vents
- Storage Piles
- Cooling Towers
- Refractory Brick Curing Heaters

The specific emission calculation methodologies for these source types are described in Section 3 of the PSD Application, which is on file with DEQ and available to the public upon request.

Class II Area Modeling Analyses

Pursuant to ARM 17.8.820 and 40 CFR 52.21(k), SME must demonstrate that emissions from the proposed project would comply with the NAAQS, MAAQS, and Class II PSD Increments. DEQ reviewed all monitoring and modeling submitted by SME and found it to conform to all requirements.

Model Selection
At the time of submittal of the Application, EPA's modeling guidance (40 CFR Part 51, Appendix W) indicated that the Industrial Source Complex Short Term (ISCST3) dispersion model was the approved model for stationary source modeling for analyses including both simple and complex terrain types. The area surrounding the site is a combination of simple and complex terrain. Simple terrain has an elevation between ground level and stack release height. Complex terrain has an elevation that is at, or greater than, the height of the stack being modeled.

Further, the impacts of structures on plume travel (downwash, which can lead to elevated ground level concentrations) can be evaluated using the EPA's Building Profile Input Program (BPIP) or BPIP with plume rise enhancements (BPIP-PRIME) (EPA, 1985). Their use requires the use of ISC-PRIME. ISC-PRIME was proposed for approval by EPA in 65 FR 21506 (April 21, 2000).

Since the date of submittal of the PSD application, 40 CFR Part 51, Appendix W was revised on November 9, 2005, with an effective date of December 9, 2005. This current version of Appendix W indicates that AERMOD should be used for appropriate applications as a replacement for ISCST3. On December 15, 2006 DEQ received revised modeling of the HGS facility (Bison, 2006b). New modeling was conducted based on the footprint of the facility at the alternative location described in Section 2.2.2 of this EIS. The revised modeling followed the November 9, 2005 version of Appendix W, with the primary change being the use of the AERMOD model instead of the older ISC-PRIME model. The change in location and change in dispersion model made little difference in the modeled Class II impacts. Impacts at Class I receptors were not remodeled because only minor changes in results would be expected due to long distance to the receptors.

Meteorological Data
A PSD Class II dispersion modeling analysis requires the use of either one year of onsite meteorological data or five years of representative data. In this case, onsite data were not available. The Great Falls International Airport is relatively close to the proposed plant location, and has similar topography. Consequently, the National Weather Service (NWS) data from the Great Falls International Airport was an acceptable alternative. ISC-PRIME met data requires both surface data (wind speed, wind direction, temperature, and cloud cover) and upper air data (mixing heights) to be processed in a single model-ready input file. The most recent readily-available five years of data from the airport were processed with AERMET and used (1999-2003) in the AERMOD model. Concurrent upper air data from the Great Falls airport was used in the data processing.

Receptor Grids
The AERMOD model calculates ground level concentrations at specific locations referred to as receptors. A gridded network of receptors is referred to as a Cartesian receptor grid. Receptors

placed at increasing spacing with distance, extended to 28 km (17 miles) in all directions as well as along the HGS property boundary for the initial modeling analysis, are referred to as the significant impact area analysis. For refined modeling at locations where impacts were above the significance levels, receptor grids extended to a distance necessary to ensure that the overall high concentration in the impact area was located.

Terrain
The terrain elevation for each receptor was determined using United States Geological Survey (USGS) 7.5-minute Digital Elevation Model (DEM) data in the UTM NAD27 datum coordinate system. The UTM grid system divides the world into coordinates that are measured in East meters (measured from the central meridian of a particular zone, which is set at 500,000 m) and North meters (measured from the equator).

The DEM files obtained from the USGS have terrain elevations at 30-m intervals. The terrain height for each receptor was calculated by interpolating the terrain height from the digital terrain elevations surrounding the receptor. This methodology ensures a consistent and accurate determination of elevation for each of the individual receptors. AERMAP was used to process the receptor elevation data for use in the AERMOD model.

Emission Rates
EPA's modeling guidance requires that modeled emission rates match the averaging period being modeled. That is, to demonstrate compliance with a 1-hour standard, the maximum 1-hour emission rate is used in the model. When demonstrating compliance with a standard based on annual average data, the annual average emission rate on an hourly basis is used. Table 6.1-1 of the PSD Application provides the specific emission rates per pollutant and averaging period that were used in the dispersion modeling analysis.

Source Types
AERMOD allows emission sources to be modeled as point sources (stacks), volume sources (material handling activities), and area sources (haul roads and storage piles). Tables 2 and 3 of SME's December 2006 Air Dispersion Modeling Report (Bison, 2006b) provide the specific parameters utilized for these source types in the model.

Class II Area Significant Impact

In accordance with EPA guidelines, modeled concentrations resulting from the proposed project are compared to applicable Class II significant impact levels (SIL's) . If a significant impact (i.e., an ambient impact above the SIL for a given pollutant and averaging period) is not observed, no further modeling analysis (i.e., NAAQS, MAAQS, or Class II PSD Increment modeling) is required for that pollutant. If a significant impact is shown, NAAQS, MAAQS, and PSD Increment modeling are required. A Radius of Impact (ROI) is determined for each pollutant that would exceed the SIL. The ROI encompasses a circle centered on the HGS plant with a radius extending out to the farthest location where the emissions increase of a pollutant from the project would be above the SIL. All sources within the ROI are assumed to potentially contribute to ground-level concentrations and are evaluated for possible inclusion in the NAAQS, MAAQS, and PSD Increment analyses. Table 4-5 provides the results of the MSL and ROI analyses.

Table 4-5. Class II Significant Impact Modeling Results

Pollutant	Averaging Period	HGS Concentration (µg/m3)		Significant Impact?	ROI (km)
		Significance Level	Peak Model Predicted		
PM_{10}	24-hr	5	11.0	Yes	1.1
	Annual	1	2.2	Yes	1.8
SO_2	3-hr	25	15.9	No	N/A
	24-hr	5	7.2	Yes	0.6
	Annual	1	0.24	No	N/A
NO_X	Annual	1	1.1	Yes	0.6
CO	1-hr	2,000	90.3	No	N/A
	8-hr	500	26.3	No	N/A

The maximum-modeled impacts of the project exceed the SILs for PM_{10}, SO_2 (24-hr averaging period), and NO_X. The modeled impacts are below the SILs for CO for both averaging periods. Consequently, CO is considered to have an insignificant impact and is not required to be evaluated further.

Class II Pre-Construction Monitoring Analysis

The modeled concentrations resulting from the plant must also be compared to the monitoring *de minimis* levels to determine if pre-construction monitoring is required. The results of the monitoring *de minimis* evaluation are provided in Table 4-6.

The maximum-modeled concentrations of PM_{10} were above the monitoring *de minimis* level for PM_{10}. Consequently, one year of PM_{10} monitoring data was required. Data were collected at a location near the proposed HGS plant. The results demonstrated that ambient concentrations of PM_{10} in the area are very low. The highest 24-hr concentration was 23 µg/m³ (the 24-hr standard is 150µg/m³) and the annual concentration was 7 µg/m³ (the annual standard is 50 µg/m³).

Table 4-6. Maximum Modeled Impacts Compared to Monitoring *de minimis* Levels

Pollutant	Averaging Period	Concentration (µg/m3)		Monitoring Required?
		Monitoring *de minimis* Level	Peak Model Predicted	
PM_{10}	24-hr	10	11.0	Yes
SO_2	24-hr	13	7.2	No
NO_X	Annual	14	1.1	No
CO	8-hr	575	26.3	No
Lead	Calendar Quarter	0.1	0.0005	No
Fluorides	24-hr	0.25	0.12	No

Class II Area NAAQS and MAAQS Analysis

Since HGS has impacts above the SILs, all non-HGS sources that have the potential to impact the HGS significant impact area were included in the Class II NAAQS and MAAQS analyses. The non-HGS sources include: Montana Megawatts I, LLC (proposed gas-fired power plant), Montana Ethanol Project (proposed ethanol plant), International Malting Company (malting plant), Malmstrom Air Force Base (boilers), and Montana Refining Company (petroleum refinery).

The ambient concentrations from other activities, such as agricultural activities, highways, and naturally occurring levels of pollutants, are accounted for by adding a background concentration to the modeled concentrations prior to comparing the results to the NAAQS or MAAQS. The gaseous pollutant background concentrations used in the analysis are the typical values provided by DEQ for modeling analyses in Montana. SME's on-site PM_{10} monitoring data results were used for PM_{10} background values.

The modeling results in Table 4-7 demonstrate that the high modeled concentrations from HGS sources, non-HGS sources, and background concentrations combined are less than 25 percent of the respective NAAQS or MAAQS in all cases except 1-hr NO_X which is approximately 56 percent of the MAAQS. Consequently, it is not anticipated that the proposed plant would cause or contribute to an exceedance of a NAAQS or MAAQS. Further, although the magnitude of the NO_X impacts would be moderate, these impacts would occur at specific receptors and decrease rapidly with distance from the location of the high impact.

Table 4-7. SME NAAQS/MAAQS Compliance Demonstration

Pollutant	Avg. Period	Modeled Conc.[a] ($\mu g/m^3$)	Backgrnd Conc. ($\mu g/m^3$)	Ambient Conc. ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	% of NAAQS	MAAQS ($\mu g/m^3$)	% of MAAQS
PM_{10}	24-hr	10.3	23	33.3	150	22	150	22
	Annual	2.31	7	9.31	------	------	50	19
$PM_{2.5}$[b]	24-hr	10.3	23	33.3	35	95	------	------
	Annual	2.31	7	9.31	15.0	62	------	------
NO_2	1-hr	240[c]	75	315	------	------	564	56
	Annual	1.4[d]	6	7.4	100	7.4	94	7.9
SO_2	1-hr	72.0	35	122	------	------	1,300	9.4
	3-hr	44.3	26	70.3	1,300	5.4	------	-----
	24-hr	7.8	11	18.8	365	5.2	262	7.2
	Annual	0.7	3	3.7	80	4.6	52	7.1
Pb	Quarterly[e]	0.0005	Not. Avail.	0.0005	1.5	0.03		
	90-day[e]	0.0005	Not. Avail.	0.0005	-----	-----	1.5	0.03

[a] Concentrations are high-second high values except annual averages and SO_2 1-hr, which is high-6th-high.
[b] The $PM_{2.5}$ compliance demonstration assumes all PM_{10} is $PM_{2.5}$.
[c] One-hour NOx impact is converted to NO_2 by applying the ozone limiting method, as per DEQ guidance.
[d] Annual NOx is converted to NO_2 by applying the ambient ratio method, as per DEQ guidance.
[e] SME reported the 24-hour average impact for compliance demonstration.

Class II Area PSD Increment Analysis

The determination of the emissions that consume PSD Increment is based on the current level of actual emissions in relation to actual emissions at the baseline date. The major source baseline date is the date after which actual emissions associated with construction (i.e., physical changes or changes in the method of operation) at a major stationary source affect the available PSD Increment. The trigger date is the date after which the minor source baseline date may be established. The minor source baseline date is the earliest date after the trigger date on which a complete PSD application is received by the regulatory agency. The date marks the point in time after which actual emission changes from all sources affect the available PSD Increment.

The minor source baseline dates for NO_X, SO_2, and PM_{10} all have been triggered in the Great Falls area. The non-HGS emission sources used in the PSD modeling are the same as for the NAAQS and MAAQS modeling. However, the emission rate for non-HGS sources are the two-year average actual emission rate if the source has been in operation for more than two years (otherwise, the maximum is used).

The PSD modeling results in Table 4-8 show that the high modeled concentrations from PSD increment consuming sources (HGS sources and non-HGS sources combined) are 35 percent or less of the respective PSD Increments for all pollutants and averaging periods.

Table 4-8. Class II PSD Increment Compliance Demonstration

Pollutant	Avg. Period	Met Data Set	Modeled Conc. ($\mu g/m^3$)	Class II Increment ($\mu g/m^3$)	% Class II Increment Consumed	Peak Impact Location (UTM Zone 12)
PM_{10}	24-hr	Great Falls 2003	10.3	30	34%	(497227, 5266071)
	Annual	Great Falls 2003	2.31	17	14%	(497901, 5266560)
SO_2	3-hr	Great Falls 2003	12.6	512	2.5%	(497069, 5266071)
	24-hr	Great Falls 2003	6.33	91	7.0%	(497713, 5266416)
	Annual	Great Falls 1999	0.311	20	1.6%	(498700, 5267500)
NO_2	Annual[b]	Great Falls 2003	1.18	25	4.7%	(497701, 5266703)

a – Compliance with short-term standards is based on high-second-high impact.
b – Annual NO_x impacts are compared to the NO_2 standards.

CFB Startup Analysis

EPA's modeling guidance recommends that, for applications where the source can operate at substantially less than design capacity, and the changes in stack parameters could lead to higher ground level concentrations, the load or operating condition that causes maximum ground-level concentrations should be determined. SME's boiler startup procedures fall into this category of analyses.

Three boiler startup scenarios were evaluated. For CFB boiler startup, SME would use both fuel oil and coal to initiate boiler operations, with the switch from fuel oil to coal firing occurring at approximately 30 percent of maximum boiler load. Firing at approximately 70 percent of maximum boiler load, all emission controls are expected to be operating. Consequently, the CFB at 30 percent of maximum load with oil only, the CFB at 30 percent of maximum load with coal only, and the CFB at 70 percent of maximum load with coal only were evaluated.

Modeling results provided in Tables 7 and 8 of the December 2006 modeling report demonstrate that the high-modeled concentrations resulting from the startup scenarios are less than the NAAQS, MAAQS, and PSD Increments for all pollutants and averaging periods.

Class II Soil and Vegetation Impacts Analysis

Montana's PSD permitting regulations require that the impacts of a proposed plant's projected emissions on soil and vegetation be evaluated. The primary NAAQS for criteria pollutants were developed to provide adequate protection of human health, while the secondary standards were designed to protect the general welfare, i.e., manmade and natural materials including soils and vegetation. EPA guidance on new source review supports this by stating:

> *For most types of soils and vegetation, ambient concentrations of criteria pollutants below the secondary national ambient air quality standards (NAAQS) will not result in harmful effects (EPA, 1990).*

The results of the air quality analysis demonstrate that the impacts of the HGS plant are insignificant (i.e. less than the PSD modeling significance levels, which are more conservative than the NAAQS) for CO. The modeled concentrations of NO_2, SO_2, and PM_{10} for the plant and other interactive sources surrounding the plant were less than the NAAQS and MAAQS. Since the air quality analysis shows that emission impacts are either insignificant or below the NAAQS and MAAQS, the plant is predicted to have a minor impact on the soil and vegetation in the area surrounding the plant.

Effects of Criteria Pollutant Concentrations on Sensitive Plant Species

The EPA also provides a screening document as a guide for determining the impacts of the projected emissions on plants, soils, and animals (EPA, 1981). The December 2006 modeling report, Table 9, provides a comparison of modeled (predicted) concentrations to sensitive species concentrations by pollutant and averaging period. The predicted impacts are below the identified sensitive species concentrations and are considered to be minor.

Effects of Trace Element Deposition on Soils, Plants, and Animals

The EPA screening document also suggests an analysis of trace elements that could be deposited and contaminate soil and plant tissue. Predicted deposition levels were estimated by calculating the ratio of total HGS annual trace element emissions to total HGS annual NO_X emissions and multiplying the highest NO_X modeled concentration by this ratio. The resulting calculated trace

element concentration was then multiplied by a deposition factor to calculate trace element deposition impacts.

The deposition analysis was performed for each of the trace elements for which screening concentrations were provided in EPA's screening document. The results of the analysis were provided in Table 10 of the December 2006 modeling report.

The calculated deposition levels were below all of the screening values for the forty-year life of the facility. Consequently, trace compound and elements deposition from the proposed plant is predicted to have a minor impact on soil, plants, or animals.

Minor Source Growth Analysis

Minor source growth is expected to occur in the surrounding area due to the construction and operation of the facility. Emissions of criteria pollutants and HAPS associated with this growth are expected to be minor.

Summary of Class II Area Impact Analysis

The Proposed Action would cause a number of on-site and off-site impacts on air quality, ranging from negligible to moderate in intensity. More specifically, the Proposed Action would result in:

- Short-term, minor to moderate degradation of local air quality from construction activities
- Long-term minor to moderate degradation of local air quality from operations
- Long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition.

4.5.2.2.3 Impacts on Air Quality in Class I Areas

SME submitted modeling to analyze impacts on air quality and air quality related values (AQRV's) in Class I areas. AQRV analysis included ambient concentrations, visual plume analysis, acid deposition and regional haze. The modeling was based on the permitted emission rates for the Proposed Action.

The regional haze analysis for the Proposed Action considered visibility-affecting air pollutants, including the following –

- NOx
- SO_2
- Sulfate (SO_4)
- Elemental carbon (EC)
- Secondary organic aerosols (SOA)
- Coarse particulate matter (with aerodynamic diameter greater than 2.5 microns but not exceeding 10 microns)
- Fine particulate matter (with aerodynamic diameter not exceeding 2.5 microns)

The emission sources for the regional haze analysis included the CFB boiler and the material handling baghouses. Fugitive emissions were not included in the analysis since it is expected that these emissions would not be significant to the long-range transport (over 50 km) of emissions to the Class I areas that potentially could be affected. The same emissions were also used for the PSD Class I increment impact analysis and acid deposition analysis by considering the contributions from the appropriate air pollutants.

PSD Class I Increment Impacts from the Proposed Action

Analysis results indicate that the maximum predicted Class I increment impacts due to NOx and PM_{10} emissions from the Proposed Action would be below the applicable EPA-proposed Class I increment significance levels as shown in Table 4-9. Because the impacts are less than 50 percent of the Class I increments, the adverse impacts for both NOx and PM_{10} emissions would be minor for all applicable long-term/short-term averaging periods. The predicted annual SO_2 impacts from the Proposed Action would be less than 50 percent of the Class I increment for all Class I areas and thus would be considered minor.

The predicted 3-hour and 24-hour SO_2 impacts exceed the EPA-proposed PSD Class I significance levels in some Class I areas (i.e., Scapegoat Wilderness Area for the 24-hour period and the Gates of the Mountains Wilderness Area for the 3-hour and 24-hour periods), triggering the requirement for cumulative impact modeling. Cumulative impacts analysis including the HGS emissions and other PSD increment-consuming sources in the nearby area indicates that the total impact would be less than 50% of the 3-hour and 24-hour SO_2 Class I increments. As such, the predicted 3-hour and 24-hour SO_2 impacts would be minor. Table 4-9 summarizes the predicted impacts on the Class I increments from the Proposed Action.

Table 4-9. Class I PSD Increment Compliance Demonstration

Pollutant	Avg. Period	Class I SIL (µg/m^3)	Peak Modeled Conc. (µg/m^3)	Class I Increment (µg/m^3)	% Class I Increment Consumed	Class I Area of Peak Impact Location
PM_{10}	24-hr	0.3	0.197	8	2.5%	Scapegoat Wilderness Area
	Annual	0.2	0.0070	4	0.18%	UL Bend Wilderness Area
SO_2	3-hr	1.0	1.08 (HGS only) 2.34 (cumulative)	25	4.3% 9.4%	Gates of the Mountains Wilderness
	24-hr	0.2	0.25 (HGS only) 0.57 (cumulative)	5	5.0% 11%	Gates of the Mnt.and Scapegoat Wilderness
	Annual	0.1	0.0060	2	0.30%	UL Bend Wilderness Area
NO_2	Annual[b]	0.1	0.0061	2.5	0.24%	UL Bend Wilderness Area

a – Compliance with short-term standards is based on high-second-high impact.
b – Annual NO_x impacts are compared to the NO_2 standards.

Visual Plume Impacts from Proposed Action

Since all Class I areas are more than 50 km away from the site considered in the Proposed Action, a visual plume impact analysis is not required by the FLMs. ARM 17.8.1106 requires an analysis of visual plume impacts at Class I areas. Therefore, a visual plume analysis was performed at the Class I area closest to the proposed site (i.e., the Gates of the Mountain Wilderness Area, which is about 86 km to the southwest of the proposed site). The visual plume analysis examined both the plume contrast changes and color difference changes for an observer gazing both inside and outside of the Class I area. For the Proposed Action, a plume (with facility-wide emissions of NOx and PM_{10}) was modeled from the source to the Class I area at an angle of 11.5 degrees from the line of the source to the observer. The Level-1 screening analysis with the worst-case meteorological conditions was performed and results were compared with the "critical" values in the EPA Visual Plume Impact Screening and Analysis Workbook (EPA-450/4-88-015). The predicted visual plume impacts all were less than the critical values (i.e., less than the EPA critical thresholds) and thus minor. The total facility-wide allowable emissions rates of 103.4 lbs/hr nitrogen oxides (NOx) and 277 lbs/hr PM_{10} were used in the visual plume impact analysis of emissions from the Proposed Action.

Acid Deposition Impacts from Proposed Action

Acid deposition impacts from the Proposed Action were evaluated with respect to the annual nitrogen (N) and sulfur (S) deposition in the Class I areas that potentially could be affected. Nitrogen deposition occurs from the dry and wet deposition of nitrogen-containing chemicals, including NOx, nitric acid (HNO_3), and nitrate ion (NO_3^-). Sulfur deposition occurs from the dry and wet deposition of sulfur-containing chemicals, including SO_2 and sulfate (SO_4). The predicted annual average deposition rates for N and S were compared to the applicable FLM-established Deposition Analysis Threshold (DAT). Predicted peak annual average N and S deposition rates were below the corresponding DAT for all Class I areas. In conclusion, the acid deposition impacts from the Proposed Action would be minor (i.e., less than the FLM guidance thresholds).

Regional Haze Impacts from Proposed Action

The regional haze impact analysis was conducted with the CALPUFF modeling system, which includes three main programs: CALMET (the meteorological processor), CALPUFF (the dispersion model), and CALPOST (the post-processing utility). The CALPUFF modeling system is the EPA-preferred long-range transport model for Class I analyses. In the CALMET analysis, mesoscale (MM4 and MM5) meteorological data are used for the initial windfield predictions. CALMET then generates three-dimensional, hourly, gridded fields of met variables accounting for direct observations of meteorological variables and dispersion effects caused by terrain and surface (land use) characteristics. Direct observation data from surface, upper air, and precipitation stations within and near the modeling domain are used in this CALMET analysis. CALPUFF is a multi-layer, multi-species, non-steady-state puff dispersion model, which can simulate the effects of time- and space- varying meteorological conditions on pollutant transport, transformation, and removal. The meteorological fields predicted by CALMET are used as inputs to the CALPUFF model to ensure that the effects of terrain and

surface characteristics on meteorology are considered. CALPOST takes dispersion data from the CALPUFF model and calculates air quality impacts, such as impacts to visibility, deposition of acidic species, and concentrations.

Regional haze is evaluated using the light extinction coefficient (b_{ext}). The percentage change in the light extinction coefficient (Δb_{ext}) attributable to a particular project with respect to the background light extinction is used to determine the regional haze impacts from that project. CALPUFF modeling results are processed using the CALPOST program. CALPOST compares visibility impacts from the modeled source(s) to pre-existing visual range at the affected Class I areas and calculates a percent reduction in background extinction ($\%\Delta b_{ext}$). The Federal Land Managers' Air Quality Related Values Workgroup Phase I Report (FLAG) guideline identifies a $\%\Delta b_{ext} \geq 5\%$ as the level at which a cumulative analysis is triggered and a $\%\Delta b_{ext} \geq 10\%$ as the level at which the FLM might object to the permit.

While the FLAG document provides guidance for conducting the regional haze impact analysis, 40 CFR §51.30 states that determination of adverse impact on visibility must be made on a case-by-case basis taking into account the geographic extent, intensity, duration, frequency and time of visibility impairments, and how these factors correlate with:

(1) Times of visitor use in the federal Class I area, and
(2) Frequency and timing of natural conditions that reduce visibility.

SME provided a preliminary regional haze analysis following the methodology described in the FLAG document (FLAG, 2000). The FLAG guideline calls for the most conservative CALPOST visibility calculation method, which compares all modeled impacts to an essentially unrestricted visual range and does not account for natural conditions such as rain, snow or fog, that reduce visibility.

SME's preliminary visibility analysis followed the FLAG guideline. SME's modeled $\%\Delta b_{ext}$ values were below 5 percent on 1,027 of the 1,081 days modeled. These results are considered preliminary results because they do not take into account the possible presence of natural conditions obscuring background visibility. SME refined the visibility modeling using weather data to more closely approximate the natural visual range on the days the modeled $\%\Delta b_{ext}$ values exceeded the FLAG guideline values. No $\%\Delta b_{ext}$ values ≥ 5 percent were modeled in the Anaconda-Pintler or Mission Mountains Wilderness Areas, so those areas were dropped from the refined analysis. The year 1990 was dropped form the Glacier National Park and UL Bend Wilderness analyses for the same reason. Preliminary visibility modeling results are contained in Table 4-10, and refined results are contained in Table 4-11.

The results of the refined analysis showed six days in which the modeled $\%\Delta b_{ext}$ values from the Proposed Action were ≥ 5 percent. Cumulative impact modeling was performed for those days to determine the $\%\Delta b_{ext}$ value from all the existing permitted PSD-increment consuming sources that could contribute to visibility reduction. The modeling showed four days with cumulative modeled $\%\Delta b_{ext}$ value greater than 10 percent.

Table 4-10. SME Preliminary Visibility Results

Class I Area	Met Data Year	Max. %ΔB_{ext} 24-hr Average	Number of Days %$\Delta B_{ext} \geq 5.0\%$	Number of Days %$\Delta B_{ext} \geq 10.0\%$
Anaconda-Pintler Wilderness Area	1990	1.91	0	0
	1992	1.39	0	0
	1996	1.81	0	0
Bob Marshall Wilderness Area	1990	8.37	1	0
	1992	10.09	2	1
	1996	14.37	7	2
Gates of the Mountains Wilderness Area	1990	6.03	1	0
	1992	17.70	6	2
	1996	16.25	10	2
Glacier National Park	1990	2.78	0	0
	1992	11.84	1	1
	1996	16.25	4	1
Mission Mountains Wilderness Area	1990	1.71	0	0
	1992	2.41	0	0
	1996	1.53	0	0
Scapegoat Wilderness Area	1990	13.18	1	1
	1992	10.00	4	1
	1996	13.39	8	4
UL Bend Wilderness Area	1990	4.50	0	0
	1992	8.47	5	0
	1996	9.01	4	0

The geographic extent of the modeled visibility impacts is fairly large on the peak day, but this is expected due to the wide expanse of the modeling domain. The intensity of visibility impacts, as reflected in the modeled %Δb_{ext} values from SME are less than 5 percent (the FLM level of concern) for >99 percent of the days modeled and are all less than 10 percent. Cumulative modeled %Δb_{ext} values are less than 10 percent (the FLM level of concern) for >99 percent of the days modeled.

Table 4-11. SME Final Visibility Results (Refined Methodology)

Class I Area	Met Data Year	Max. ΔB_{ext} 24-hr Average	Number of Days %$\Delta B_{ext} \geq 5.0\%$	Peak Cumulative %ΔB_{ext}
Bob Marshall Wilderness Area	1990	1.57	0	NA
	1992	6.90	1	14.45
	1996	9.92	2	19.21
Gates of the Mountains Wilderness Area	1990	5.62	1	5.63
	1992	4.32	0	NA
	1996	5.77	1	15.05
Glacier National Park	1992	3.92	0	NA
	1996	1.21	0	NA
Scapegoat Wilderness Area	1990	2.31	0	NA
	1992	4.30	0	NA
	1996	5.31	1	13.65
UL Bend Wilderness Area	1992	2.09	0	NA
	1996	4.47	0	NA

Peak modeled visibility impacts are strongly influenced by the high levels of humidity in the modeled air, a condition that generally results in rain, snow or fog. Although the final analysis accounts somewhat for naturally occurring impairments to visibility, it does not fully address the presence of snow or rain in the wilderness areas. DEQ has reviewed historical meteorological data to supplement the evaluation of the visibility assessment. The data records show that the meteorological conditions that result in higher modeled $\%\Delta b_{ext}$ values generally cause natural conditions that reduce visual range.

In summary, the regional haze analyses for both the proposed source only and the cumulative sources indicate that the Proposed Action would not cause a significant adverse regional haze impact in Class I areas and that impacts would be moderate. Visibility impacts that could be perceptible based on FLM guidelines were modeled primarily in November and March. Peak visitation times for the wilderness areas are July through October, when the weather is favorable and there is less chance of snow.

Summary of Class I Area Impact Analysis

The Proposed Action would cause off-site impacts on PSD Class I increments and several AQRVs (visual plume, regional haze, and acid deposition), ranging from negligible to moderate in intensity. None of these impacts would be significant, but they would contribute small changes to identified environmental resources in the Class I areas. More specifically, the Proposed Action would result in the following impacts on the Class I areas:

- Short-term/long-term direct minor adverse impact on applicable PSD Class I increments
- Direct minor, adverse impact on visual plume
- Direct long-term, minor adverse impact on acid deposition
- Direct short-term, moderate adverse impact on regional haze

4.5.2.2.4 Mercury Emissions

Chapter 3 contains an extensive discussion of mercury in the environment – including emissions and deposition data, atmospheric transport, transformation into methylmercury, human health and ecological effects, and recent efforts to regulate mercury emissions at both the federal and state levels. This information will not be repeated here.

The sub-bituminous PRB coal that would be utilized in the Highwood Generating Station is generally low in mercury content. The average mercury concentration is approximately 0.07 parts per million (ppm). Other types of coal (*e.g.*, the anthracite coal typically mined in the Eastern U.S.) can have mercury concentrations more than three times as high (Whilhelm et al., 2003), while the national average is 0.17 ppm (USGS, 2001), or almost two and a half times as high. SME's proposed facility would also have in place emission control equipment allowing for co-benefit capture rates of mercury emissions (DEQ, 2006a).

The HGS would employ an Integrated Emissions Control Strategy (IECS), including the CFB boiler, hydrated ash re-injection or equivalent FGS system, selective non-catalytic reduction, and a fabric filter (bag house). In February 2005, in conjunction with a major international CFB

manufacturer, SME conducted a test burn in a scaled model CFB test boiler located in Connecticut. The test burn was conducted using 80 tons of southeastern Montana PRB coal and 20 tons of Montana limestone. Mercury capture rates of approximately 88 percent (0.7 lb/TBtu) from the test burn indicate that the HGS would be able to meet all federal regulations utilizing the proposed IECS (SME, 2005i).

When coal burns, mercury is released in one of three forms, or species: elemental mercury vapor, oxidized mercury vapor (Hg^{2+}), or mercury adsorbed to the surface of a solid particle. The different species of mercury respond differently to different types of control technologies. Elemental mercury is the most difficult of the three mercury species to control. To date, no technologies have been demonstrated in field-testing to consistently and significantly reduce elemental mercury emissions. Most research is focused on developing effective means for converting elemental mercury to one of the other two species of mercury (DEQ, 2006a).

Bituminous coal generally contains higher levels of chlorine, contributing to oxidization of mercury to Hg^{2+}, and has therefore proven to provide enhanced capacity for reducing stack mercury emissions. Conversely, sub-bituminous coal and lignite generally contain low concentrations of chlorine. Control of mercury emissions resulting from combustion of these fuels has proven to be highly variable.

The level of mercury removal in SME's 2005 pilot test results was much greater than for most utility boilers burning sub-bituminous coal and utilizing native control systems. It is also near the high end of values observed in the many test programs that have been and are being conducted on sub-bituminous coal combustion in utility boilers. However, the test burn alone does not provide sufficient data to allow boiler manufacturers to confidently extrapolate the data and guarantee mercury emissions control in a full-scale CFB unit with IECS (DEQ, 2006a).

DEQ verified information contained in the SME-HGS application for the Montana air quality permit, including mercury-specific source testing results obtained through the simulated and comprehensive combustion, performance, and emission testing program conducted prior to application. Taking into consideration this information, plus technical, environmental, and economic factors, as well as a recent mercury specific BACT determination for a similar source permitted for operation in Montana, DEQ determined that the appropriate mercury BACT emissions limit(s) for the proposed project incorporating the IECS would be either:

- 90 percent mercury reduction, based on a 12-month rolling average, or
- 1.5 lb mercury/TBtu (trillion Btu), based on a 12-month rolling average.

The two-part limit accounts for two complementary operational factors. First, coal quality is not constant, even within a given coal deposit. At the extremely low mercury content values under consideration, a small change in coal mercury content can have a significant impact in compliance potential. Second, control efficiencies generally decrease as inlet concentrations decrease, particularly as inlet concentrations become very low, as in the case of mercury concentrations in utility boiler exhaust. If SME-HGS should receive coal with higher than normal mercury content, it may be difficult to comply with the lb/TBtu limit, but compliance with the percent reduction requirement would be achievable. Conversely, if a particular coal

supply contains less mercury than normal, the percent reduction requirement may be less readily attainable while the emission rate may be more so (DEQ, 2006a).

To confirm the performance of the CFB Boiler and IECS in reducing mercury emissions, SME-HGS would be required to monitor and analyze mercury control performance data after commencement of commercial operations and to report this information to DEQ. The results of the final analysis would then be used to confirm compliance with the BACT-determined mercury emissions limits.

Table 4-12. Current and Projected Future Maximum Mercury Emissions from Coal-Fired Power Plants in Montana[1]

Plant		Annual mercury emissions in lbs.		
		Current	2010-2014 (annual)	2018[5]
Existing facilities	*MW*			
PPL - Colstrip Unit 1	358	152.6	75.7	28.4
PPL - Colstrip Unit 2	358	152.6	75.7	28.4
PPL - Colstrip Unit 3	778	321.1	159.2	59.7
PPL - Colstrip Unit 4	778	321.1	159.2	59.7
CELP[2]	41.5	21.0	10.2	3.8
PPL - Corette	163	41.2	36.8	13.8
MDU - Lewis & Clark	50	32.8	24.7	4.7
Total existing		**1,042.4**		
New and proposed facilities				
RMP[3]	160	NA	17.1	10.3
Roundup Power Unit 1	390	NA	49.1	29.5
Roundup Power Unit 2	390	NA	49.1	29.5
SME-HGS	250	NA	36.4	21.8
Sum Total[4]		**1,042**	**693.2**	**289.6**

Source: DEQ, 2006b

[1] Projected mercury emissions based on Draft Air Quality Permit limits, March 2006; estimated and projected mercury emissions are based on maximum capacity and average coal quality information from 1999 for existing sources and on the average coal quality information submitted in air quality permit applications for new sources; in addition, estimates are based on maximum nameplate capacity for 8,760 hours (24 hours per day times 365 days) per year, and thus on conservative operating capacity information.
[2] Colstrip Energy Limited Partnerships
[3] Rocky Mountain Power
[4] Existing plus new and proposed
[5] With implementation of CAMR and Montana's mercury limits

If the CFB Boiler operating with the IECS is unable to demonstrate compliance with the mercury limits established through the BACT determination, SME-HGS would be required to achieve the BACT-determined mercury reductions/limits through the installation and operation of mercury-specific emission controls. In that case, within 18 months after commencement of commercial operations, SME-HGS shall install and operate, as needed to comply with the applicable mercury

emission limits, an activated carbon injection control system or, at SME-HGS's request and as approved by DEQ, an equivalent technology (equivalent in removal efficiency).

With the IECS in place, annual mercury emissions from the HGS would be approximately 34.5 lbs. (15.7 kg), slightly less than its 2010-2014 allotment of 36.4 lbs (16.5 kg) under Montana's mercury rules. Currently operating coal fired power plants in Montana have emitted as much as 1,042 lbs. (474 kg.) of mercury in a year (DEQ, 2006b). However, as seen in Table 4-12, by 2018, combined statewide mercury emissions are projected to decrease by 72 percent, from 1,042 lbs. to 290 lbs. annually, as a result of implementing the CAMR and Montana's mercury limits. Under Montana's mercury rules, each Montana coal-fired power plant, including SME-HGS, would have to reduce the rate of mercury emissions to 0.9 lb./TBtu by 2018 (DEQ, 2006b).

Due to low chlorine levels in its source sub-bituminous coal, stack mercury emissions from the HGS would be primarily in the form of elemental mercury rather than ionic mercury. Ionic mercury is more easily "scavenged" from the air by attaching to particles or through precipitation, and would therefore tend to be deposited closer to the HGS. In contrast, as explained in Section 3.3.5, the elemental mercury species in the form of mercury vapor does not tend to fall out nearby and is readily transported long distances through the atmosphere. Thus, mercury emissions from the HGS would likely cause a minor change in the local deposition of mercury, while contributing 0.0003 percent to the global stock of atmospheric mercury – estimated at 5,200 metric tons (UNEP, 2002) – and distributed around the world due to air currents.

In conclusion, the HGS, by meeting Montana's mercury emission limits, would likely have minimal impact on environmental mercury levels both locally and in Montana as a whole.

4.5.2.2.5 Greenhouse Gas Emissions

The greenhouse effect and the potential implications of global climate change are summarized in Chapter 3 (Section 3.3.6). This section focuses on carbon dioxide and other greenhouse gas emissions from the proposed HGS as well as the potential for mitigation and offsets.

The potential facility-wide CO_2 emission rate of the HGS is 2.1 million tons (1.9 million metric tons) per year. In addition, the HGS would release methane and nitrous oxide, two other greenhouse gases. Per molecule, both of these gases have a higher global warming potential than carbon dioxide and their emissions are often quantified in terms of CO_2 equivalents. The potential facility-wide, CO_2 equivalents emission rate of these gases is 0.67 million tons (0.61 million metric tons) per year. Total GHG emissions from the HGS are 2.8 million tons (2.5 metric tons) per year.

HGS carbon dioxide emissions would constitute 0.033 percent of U.S. annual emissions of 5,843 million metric tons and 0.007 percent of global yearly emissions of 26,000 million metric tons in 2002 (Marland et al., 2005). As such, HGS's emissions would represent a very small but tangible, incremental contribution to this cumulative global issue. At the present time, U.S. emissions of greenhouse gases from all sources are unregulated and uncapped, since the U.S. is not a signatory to the Kyoto Protocol and not bound by its mandatory national reductions.

Sequestration, Mitigation and Carbon Offsets

Increasing emissions of carbon dioxide and other greenhouse gases, rising greenhouse gas concentrations in the atmosphere, and growing concern about the possible impacts of climate change have spurred interest in mitigating CO_2 emissions. In theory, a power plant could capture CO_2 by chemically or physically combining it with something that will remain as a liquid or solid rather than as a gas. However, as a practical matter, capturing that carbon dioxide before it is released to the atmosphere is very difficult. Furthermore, once captured, the CO_2 would have to be stored ("sequestered") in such a manner as to keep it permanently out of the atmosphere.

The U.S. Department of Energy, among other agencies and institutions, is conducting various research projects on methods for efficient capture and storage of CO_2. However, research has not yet identified any commercially available technique that can capture much of the CO_2 from a large-scale power plant under normal conditions (Markel, 2005). Preliminary projections suggest that the likely cost of carbon capture would add 2-4 cents/kWh for a pulverized coal plant, and would probably also reduce the power output of the plant by roughly 25 percent (Herzog and Golomb, 2004).

As to storage of the carbon, the techniques under study include injecting it below ground such as into oil or gas reservoirs to help push out more oil and gas, or into un-mineable coal beds, to push out the natural gas (methane) that occurs with the coal. Another idea is to inject CO_2 into beds of basalt rock, letting the CO_2 become bound to the basalt. This method is being researched at Montana State University and is still in the experimental stages (Capalbo, 2005). It is not a concept this Proposed Action could count on using. Even if some form of underground carbon storage were to become practical, the transport of the CO_2 to the underground storage site would add further economic and energy costs.

Other methods for CO_2 sequestration include aforestation (planting tree stands) and agricultural sequestration. These methods seek to store carbon in standing biomass (e.g trees) or in increased organic matter in soils. Certain states and regional programs offer incentives for sequestration through these methods (Lewandrowski, e al 2004). DEQ prepared a draft Greenhouse Gas Project in 1999 (http://www.ucsusa.org/clean_energy/energynet/energynet-policy-update-01062005.html#montana). The area of land that would have to be reforested or afforested to fully offset carbon emissions from the HGS (or any comparable fossil fuel generation) would be enormous and impractical. There is simply not enough arable land available for aforestation on the entire earth to fully offset global annual carbon emissions; therefore, while this process will measurably reduce the accumulation of CO_2 in the atmosphere while providing other environmental and socioeconomic benefits, it cannot be considered as an option that would make coal consumption/combustion "carbon neutral".

Therefore, while direct capture and storage of the carbon emitted by coal fired power plants is not practicable at this time, offsetting the power plant's emissions with programs that tie up increased amounts of carbon in biomass are technically feasible and may become economically attractive depending on the program's structure. In the meantime, SME and the City of Great Falls are exploring various other means of offsetting carbon emissions from the HGS and SME's overall energy portfolio.

SME customers may currently purchase “green” power, other than hydropower, at a load of 0.08 MW at an add-on rate of $10.50/MWh. Because green power, such as wind and solar power and geothermal heat, is more expensive than existing power supply contracts, SME has found most customers are reluctant to utilize green power. SME currently provides hydropower from both BPA and WAPA to meet overall customer load. The BPA power purchase agreement will begin to decrease in 2008 and completely expire by 2011 (See Section 1.4 for more detailed information).

SME has asserted that it would continue to purchase up to 20 MW of hydropower from WAPA as allowed. 20 MW of hydropower equates to 194,416 tons per year of CO_2 emissions avoided, based on less efficient Montana coal-fired boilers. In addition, SME plans to install 6 MW of wind power at the HGS site. 6 MW of wind power equates to 23,330 tons per year of CO_2 emissions based on less efficient Montana coal-fired boilers. Moreover, SME has asserted that as demand dictates, it would continue to offer additional “green power” beyond the installed wind power at HGS. The amount of this power provided to customers will vary depending upon cost and interest at that time.

SME and the City of Great Falls have applied for a one million dollar grant – a federal appropriation request through Senators Baucus and Burns and Congressman Rehberg – to help study GHG mitigation options and develop a GHG mitigation strategy for HGS. At this point in time, the grant has not been awarded; the study plan and options are to be completed if the grant is awarded.

SME has asserted that it would continue to promote use of geothermal heat pumps and it plans to provide incentives to member systems for geothermal heat pump installations for all of the five member cooperatives and the City of Great Falls. A total of 425 geothermal heat pumps are currently in service in the SME service area. Each geothermal heat pump avoids approximately 3.62 tons of CO_2 emissions per year (GeoExchange, 2006). The current number of geothermal heat pumps equates to an offset of approximately 1,539 tons per year of CO_2 emissions. At this point in time, the type of incentive has not been defined, and the future number of geothermal heat pumps on the SME system is unknown. Therefore, future GHG offset estimates from additional use of heat pumps were not calculated.

SME has asserted that it has promoted and would continue to promote energy efficiency for residential, industrial, and agricultural energy consumers. SME states that it would further develop and implement energy conservation ideas and projects as they are identified and shown to be economically feasible.

SME asserts that it is examining urban reforestation as a GHG mitigation option. A paper entitled *Tree Planting in Great Falls, The Surrounding Region and in Other Montana Urban Areas* by the City of Great Falls City Forester discusses tree canopy goals and costs. The cost of a two-inch caliper balled and burlapped tree is estimated at $300 per tree. One tree is estimated to offset approximately 0.82 ton of CO_2 (CarbonNeutral Company, 2005). At this time, SME has not finalized a plan for an urban reforestation mitigation option and has not estimated potential GHG offsets from this concept. SME is also evaluating other terrestrial carbon sequestration options (SME, 2006).

The new HGS coal-fired boiler would emit approximately 0.997 tons of CO_2 per MW. Less efficient existing boilers in Montana emit approximately 1.110 tons of CO_2 per MW (based on 2003-05 data from EPA Acid Rain Database and Montana Annual Emission Inventory Reports).

4.5.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.5.3.1 Construction

Potential short-term, construction-related impacts on air quality at the alternate site in the Industrial Park would be very similar to those of the Proposed Action at the Salem site. Exhaust emissions from equipment used in construction, coupled with likely fugitive dust emissions from the disturbed ground surface, could cause minor to moderate, short-term degradation of local air quality, but would not be high enough to result in significant deterioration. See Section 4.5.2.1 for further discussion. The closer proximity of low-density residential development to the Industrial Park site might result in somewhat greater exposure of residents to dispersed diesel exhaust and smoke than in the case of the Proposed Action, but not significantly greater.

4.5.3.2 Operation

The potential long-term, operation-related impacts on air quality at the alternate site in the Industrial Park would be virtually identical to those of the Proposed Action. Operating the HGS at the alternative site would cause a number of on-site and off-site impacts on air quality in Class II areas, ranging from negligible to moderate in intensity. More specifically, using the alternative site would result in:

- Short-term, minor to moderate degradation of local air quality from construction activities
- Long-term, minor to moderate degradation of local air quality from operations
- Long-term, minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition.

Operating SME's generating station at the Alternate Site would cause off-site impacts on PSD Class I increments and several AQRVs (visual plume, regional haze, and acid deposition), ranging from negligible to moderate in intensity. None of these impacts would be significant, but they would contribute small changes to identified environmental resources in the Class I areas. More specifically, the Alternate Site would result in the following impacts on the Class I areas of interest:

- Short-term/long-term direct minor adverse impact on applicable PSD Class I increments
- Direct minor adverse impact on visual plume
- Direct long-term, minor adverse impact on acid deposition
- Direct short-term, moderate adverse impact on regional haze

Releases of mercury and greenhouse gases at the Alternate Site and small, but tangible, incremental contributions to long-term cumulative effects from those emissions would be identical to those of the Salem site.

4.5.4 CONCLUSION

The No Action Alternative would not result in any direct air quality impacts from either the Salem or Industrial Park sites, though it would contribute indirectly to air quality impacts by those power plants from which SME would purchase electricity. These impacts cannot be quantified because the fuel or energy source for the purchased electricity is not known.

Impacts of the Proposed Action – the Highwood Generating Station at the Salem site – and the alternative site – the Industrial Park site – would be similar to one another. Utilizing BACT, both alternatives would result in up to minor to moderately adverse, non-significant impacts on air quality. The wind turbines that would be installed under the Proposed Action would have no long-term adverse effect on air quality, but would indirectly have a beneficial effect by displacing up to 6 MW of electricity from other sources, potentially involving fossil fuel combustion and air emissions.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Air Quality Degradation" in Appendix J, the air quality impacts of the Proposed Action would be of minor to moderate magnitude, long-term duration, and large extent, and have a probable likelihood of occurring. Overall then, the rating for air quality impacts from the Proposed Action would be adverse and these impacts would likely be non-significant.

The air quality impacts of the Industrial Park site would be rated the same as the Proposed Action.

4.5.5 MITIGATION MEASURES

During construction, at whichever alternative site is chosen, SME and its construction contractors and sub-contractors would be required to comply with DEQ regulations to minimize emissions of fugitive dust. Construction personnel would be required to implement reasonable measures, such as applying surfactant chemicals or water to exposed surfaces or stockpiles of dirt, when windy and/or dry conditions promote problematic fugitive dust emissions. Measures such as sprinkling to keep the disturbed area damp or applying approved chemical treatments may be used.

Mitigation measures to minimize air quality degradation are already incorporated into the project design, starting from the selection of the CFB boiler itself. These measures, which include both air pollution control equipment and boiler operation practices, are summarized in Table 4-2 (the BACT Summary for CFB Boiler). The air quality permit requires SME to install and operate Continuous Emission Monitors (CEMs) to continuously measure emissions of air pollutants and verify compliance with permit limits. Additionally, CEMs for combustion gases would be linked to a computerized control room with equipment, which would adjust boiler parameters to maintain proper combustion or would set off alarms when a measurement was outside the specified operating range.

Mitigation measures intended to offset GHG emissions are listed in Section 4.5.2.2.5.

4.6 BIOLOGICAL RESOURCES

Adverse effects to flora and fauna may occur through construction or operation of the facilities or infrastructure as described in the Proposed Action. Wildlife can be directly affected by mortality due to construction or operation of the facility or its infrastructure, or indirectly through habitat loss, fragmentation, or conversion. Vegetation can be directly affected by its removal as the ground surface on which it occurs is developed, or indirectly through changing populations of wildlife that feed on plants.

Construction, maintenance, and operation of facilities in an area that contains wildlife habitat could constitute an adverse effect on those habitats. An adverse effect is found when an undertaking or action alters, directly or indirectly, any of the characteristics of a habitat that provides for life history needs such as feeding, cover, travel, or breeding.

The biological resource survey conducted in support of this EIS documented wildlife presence species and suitable habitats within the surveyed portions of the proposed project areas (WESTECH, 2005). The biological resources survey was conducted based on preliminary designs and locations of the proposed facilities. Once final design is completed and immediately prior to construction, an additional field survey will be needed to ensure that sensitive biological resources are identified, considered, and protected.

4.6.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired generating station would be constructed at either the Salem or Industrial Park sites. In addition, no 230-kV electrical transmission line interconnections would be developed in the Great Falls area. Thus, there would be no direct impacts on biological resources under the No Action Alternative, including threatened and endangered species, other species of concern, and noxious weeds.

However, SME would need to purchase power from another generation source within the WSCC to meet its projected baseload needs beginning in 2008. If generation and transmission capacity have to be expanded to meet a general growth in load to which SME would contribute, SME could be contributing indirectly and incrementally to the impacts on biological resources that occur at other locations in the Rocky Mountain West and Pacific Northwest. Depending on the type of generation (e.g., hydro, coal, natural gas, wind, solar, nuclear, geothermal) as well as the specific location of that generation and related transmission, a wide range of adverse impacts of varying intensity could occur on biological resources.

4.6.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.6.2.1 Threatened and Endangered Species and State Species of Special Concern

Bald Eagle

There is a bald eagle nest near the confluence of Belt Creek and the Missouri River, approximately one mile (1.6 km) downstream from Morony Dam. The site is about three miles (4.8 km) from both the Salem plant site and the proposed raw water pipeline intake, and is not visible from either site. The nest was active in 2005 but had fallen out of the tree sometime in 2006. The Montana Bald Eagle Management Plan (DOI 1994) provides guidelines for management activities within 2.5 miles (4.0 km) of a bald eagle nest, which define this project as within the home range of these nesting eagles. Zone III (Home Range) is defined as including all suitable foraging habitats within 2.5 miles (4.0 km) of all nest sites that have been active within five years. This zone is managed to maintain suitability of foraging habitat, minimize disturbance within key areas, minimize hazards, and maintain the integrity of the breeding area. Although the project is located within Zone III, it is located within an area with no potential habitat, no perch trees, and no screening vegetation to attract eagles. Disturbance to transitory bald eagles during construction would be minimal and limited to the time of construction.

Activities (connected actions) conducted by the contractor could conceivably be conducted outside of the project limits and closer to these nests, or other nests along the Missouri River. The Montana Bald Eagle Management Plan places limits on these high intensity activities. They should not be conducted within 0.5 mile (0.8 km) of nest locations or any other known bald eagle nests between March 1 and May 15, or within 0.25 mile (0.4 km) of nest sites from May 15 to July 15. Neither the water intake pipeline nor the current transmission line route is this close to the former nesting site near the confluence of Belt Creek and the Missouri River. If the contractor anticipates any construction operations, including the construction of transmission line interconnections and the spanning of the Missouri River by power lines, within the vicinity of an active bald eagle nest, roost site, or seasonal concentration area, or has any questions concerning the application of the regulations promulgated to protect this species, the Plan directs them to contact the USFWS and/or MFWP. The agencies can identify any restrictions that may apply to project planning, anticipated construction activities, and project scheduling. If these precautions are adhered to, the project would have no adverse effect on bald eagles.

Canada Lynx

The USFWS has published a proposed rule to designate critical habitat for the lynx which will replace the current habitat maps used by MNHP. This action is in response to a court-order, which requires that USFWS complete a final critical habitat designation for the lynx by November 1, 2006. The published map shows critical habitat west of Browning, Montana, in the high elevation habitats of Glacier National Park and the Bob Marshall Wilderness complex. There will be no designated critical habitat near the project area. The project area does not support suitable Canada lynx habitat, and lynx have not been reported within 10 miles (16 km) of the project vicinity; therefore this project would have no adverse effects on this species.

Animal Species of Concern

Habitat exists in the project area for the state listed species of concern that occur in the area. The blue sucker and spiny softshell turtle are likely to occur below Morony Dam, far enough away from the proposed project that there would be no adverse effects to these species. The sauger population may be impacted by activities during the raw water pipeline construction and placement of the intake, but these impacts would be short-term. The intake structure would be adequately screened to exclude all fish species.

The incised drainage habitat and uplands associated with the Missouri River are considered nesting habitat for the ferruginous hawk, prairie falcon, Swainson's hawk, and red-tailed hawk. No active nests were found during the survey; however, surface access limitations precluded searches of large portions of these habitats (WESTECH, 2005). Ferruginous hawks, along with many other species of raptors, would be expected during migration to be present in the HGS project vicinity. Similarly, the burrowing owl is a ground-dwelling bird associated with burrows of ground squirrel, prairie dogs, and badgers in prairie grasslands. Migratory songbirds can also be expected to use these sites for nesting and foraging. These species could occur in the incised drainage and grassland habitat of the HGS project vicinity.

The white-faced ibis, black-crowned night heron, Franklin's gull, common tern, and black tern are generally associated with wetlands and large rivers. All five species could occur along the Missouri River in the HGS project vicinity during migration, but none would be expected to nest there. All nesting records of these species are associated with Benton Lake National Wildlife Refuge, about 7-12 miles (11-19 km) from the HGS project.

Avoiding disturbance of shrub, tree, and wetland habitats would reduce adverse effects on these species by the proposed project. If these habitats must be removed, disturbed, or altered for construction or maintenance, construction contractors should avoid initiating these activities during spring nesting season. If these precautions are adhered to, the project would have no adverse effect on state listed species of concern.

Plant Species of Concern

Within 10 miles (16 km) of the HGS there are records of eight species of plants that are considered species of concern in Montana (MNHP, 2005d). Suitable habitats for most of these species (Table 3-6) are not available in the HGS project area, although roundleaf water hyssop, many-headed sedge, Guadalupe water-nymph, and California waterwort occur in shallow waters, edges of wetlands, and muddy shores of ponds and streams. These types of habitats may occur in the vegetated edge habitat created in the backwater area where the raw water intake would be located. Two species of moss (*Entosthodon rubiginosus* and *Funaria americana*) were recorded along the Missouri River upstream of the current Cochrane Dam in the late 1880s and early 1900s. Since Cochrane Dam was constructed in 1957, it is likely that the habitat for these two species was inundated. All of these records are comparatively old (Table 3-6), and were made prior to much of the human development in the area. Thus, impacts of the HGS on plant species of concern in Montana are likely to be non-existent to negligible.

Noxious Weeds

A noxious weed survey was not conducted during the field survey (WESTECH, 2006f), although a number of weedy species were observed in the field and recorded in Table 3-12. Noxious weeds tend to flourish in disturbed habitats and their expansion into new areas in particular is facilitated by linear construction projects such as roads and pipelines that disrupt soils and clear vegetation. Thus both the Salem site and the Industrial Park site, as well as the various connecting pipeline, transmission line, and road corridors would be expected to be susceptible to contributing to the spread of noxious weeds.

SME recognizes that a noxious weed inventory and Noxious Weed Management Plan must be prepared and submitted to the Cascade County Weed and Mosquito Management District prior to construction (WESTECH, 2006f; Cascade, no date-b). This plan would contain noxious weed control measures that would limit the adverse impact of the Proposed Action and Alternative site on the dispersion and expansion of noxious weeds. The district's requirements for weed management and revegetation of disturbed areas in Cascade County are located at: http://www.co.cascade.mt.us/getfile.phtml?ido=97 . Overall impacts are expected to be of a minor intensity, short-term duration and localized context.

Other Species of Interest

Several important species valued for hunting and wildlife viewing occur in the proposed project area. Mule and white-tailed deer and pronghorn antelope can be expected to occur on the proposed project site. Other game/furbearer species that could occur in the proposed project area include sharp-tailed grouse, gray partridge, coyote, red fox, mountain lion, and bobcat. No direct mortality is expected to occur from construction of the power plant and related infrastructure, but individual animals may be killed on the railway spur and on the access road.

4.6.2.2 Evaluation of Specific Proposed Action Components

Potential impacts on biological resources were derived from surveying the proposed project area and related infrastructure sites to determine whether any such biological resources exist in these areas (WESTECH, 2005). The majority of the facilities and infrastructure would be constructed on agricultural land that has been farmed for small grain for decades. Some shrub and tree habitat exists in small coulees that drain into the Missouri River on the north end of the project, and along the banks of the Missouri River.

Plant and Railroad Spur

The power generating plant and proposed railroad spur running south would be located on lands almost entirely cultivated for small grains. No vegetated drainages are crossed by the rail route. The entrance road to the plant will be upgraded to accommodate larger vehicles for construction, supply, and maintenance to the plant facility. Adverse effects on wildlife or suitable habitat by the construction or operation of the plant could occur if small mammals or birds are killed during construction or maintenance. Some individual wildlife, especially mule deer, white-tailed deer, or pronghorn could experience adverse effects through direct mortality caused by collision with

trucks on the access road or nearby trains on the spur route. Scavengers such as coyotes, mountain lions, and birds could be killed when feeding on carrion on or near railway tracks.

Transmission Lines

The proposed electrical transmission line #1 from the Salem plant to the Great Falls substation north of the Missouri River would cross cultivated grain fields, several gentle-to-moderately steep incised drainages, Box Elder Creek, and the Missouri River including its associated upland habitats and rolling grasslands. The line would cross the Missouri River upstream of Cochrane Dam, above the reservoir formed by Ryan Dam. The river in this reach has steep banks with little or no emergent vegetation. Transmission line #2 would be placed in cultivated fields and would span Box Elder Creek parallel to Transmission Line 1. The shrub and tree habitats concentrated in Box Elder Creek and vegetated incised drainages would be most sensitive to disturbance. Songbirds and raptors, small mammals, and reptiles concentrate in these areas, especially during spring breeding season. Disturbance caused by construction and maintenance should be timed to avoid breeding season, and should leave as much of the vegetation intact and undisturbed as possible.

The actual amount of each habitat disturbed by construction of the transmission line would depend on the final route location, spacing and location of structures, etc. If construction requires disturbance of the bed and banks of any drainage, such as Box Elder Creek, Stream Protection Act (SPA 124) permits would be required by FWP. If construction requires placement of fill in or near a drainage, then the Corps should be consulted to ensure compliance with Section 404 of the Clean Water Act. A 318 authorization for temporary increases in turbidity may also be required by DEQ for work in or near state waters with a potential to deliver sediment to those waters.

Fresh Water and Wastewater Pipelines

The proposed route for the fresh and wastewater pipelines follows an existing gravel county road and an abandoned railroad grade. It would cross Box Elder Creek on the existing railroad grade. As long as the final design follows this route placement, there would be no adverse effects to biological resources from burying the pipelines along an already disturbed linear route.

Raw Water Pipeline and Associated Infrastructure

The raw water pipeline is comprised of two segments: 1) the portion that would run from the plant site to the directional drill site on top of the escarpment above the Missouri River, and 2) the portion that will be drilled down to the collector well at the river. The first portion is approximately 1.5 miles (2.4 km) long, and would be buried in existing grain fields. Surface disturbances would be reclaimed to grain fields and previous land use and habitat. The second portion would create construction disturbance associated with the drill pad in the existing grain field and the collector well at the bottom of the grade. Associated infrastructure improvements consist of upgrading the existing vehicle trail in the coulee, constructing the pump house on the river bank, and building the subsurface intake located on the bed of the Missouri River.

Upland and drainage habitats would not be affected by segment one and two, and disturbed areas around the pad and well site would be reclaimed to previous habitat. If drilling were not successful and the drill pad was relocated, or drilling failed and standard trenching techniques were required, appropriate state and federal agencies would be notified prior to relocation (e.g. MFWP, DEQ, Corps). Trenching may disturb valuable shrub and trees habitats concentrated in the coulee. Upgrading the existing vehicle trail in the coulee could also impact valuable habitats. Song birds and raptors, small mammals, and reptiles concentrate in these areas, especially during spring breeding season. Disturbance caused by construction and maintenance should be timed to avoid breeding season, and should leave as much of the vegetation intact and undisturbed as possible. The actual amount of each habitat disturbed by burying the pipeline and the drill pad would depend on the final route location, level of road upgrade required to accommodate construction and service vehicles, success of drilling, etc. Direct mortality to individual animals could occur during construction or during routine road use for maintenance.

The intake structure for the raw water pipeline would be placed on the bed of the Missouri River in the reservoir created above Morony Dam. Method and placement of the pipeline and well, and post-construction reclamation, are described in Chapters 2 (Section 2.2.2.1) and under Water Resources (Section 4.4.2.1) of this chapter. Several fish species are known to be present in Morony Reservoir, and FWP and PPL Montana are using Morony Reservoir to rear sauger (a Montana species of concern) for reintroduction into riverine habitats. The proposed method of installing the intake is unlikely to cause more than a localized temporary disturbance for fish in the reservoir and a minor amount of turbidity; extreme stressing or any mortality would be unlikely. Similarly, fish would not be harmed by the process of withdrawing water at the intake.

As noted above, several permits would be required by state and federal agencies if construction or operational activities would impact the bed, banks, or water quality of water bodies. These permits often apply even when live water is not present year-round. The water quality of wastewater returned to the Missouri River would need to comply with current federal and state water quality regulations, including any restrictions on pollutant loads due to ongoing Total Maximum Daily Load (TMDL) program imposed on the City of Great Falls' sewage treatment plant's discharge permit. The preferred method of disposal is to return HGS wastewater to the City of Great Falls, where it would be subject to pretreatment standards, and not water quality standards or limits applicable to discharges directly into the Missouri River.

If the final design follows the proposed route placement and no drilling complications arise, there would be no adverse effects to biological resources from burying the pipelines and directional subsurface drilling.

Wind Turbine Generators

Chapter 2 (Section 2.1.3.1) discussed the potential impacts of wind energy development on wildlife. In general, impacts consist of habitat fragmentation and the potential for direct mortality to birds and bats from collisions with the stationary tower/pole or spinning blades; the latter impact is usually of greater concern. This would also be true in the case of the HGS and Salem site, where fragmenting low-value wheat field habitat by installing wind turbines would constitute a negligible impact on wildlife.

In recent years, low-speed, tubular-constructed wind turbine technology has been emphasized, and the design of the proposed HGS wind turbines reflects this broader trend. These larger and slower-moving turbines can still kill raptors, passerines (perching birds), waterbirds (e.g. waterfowl, wading birds), other avian species, as well as bats, though at a substantially lower rate than earlier, smaller lattice-supported WTGs with faster-moving blades. Low wind speed turbine technology like that employed by the proposed HGS WTGs requires much larger rotors whose blade tips can exceed 200 mph (323 km per hour) under windy conditions. A bird approaching rapidly spinning turbine blades may experience “motion smear” – the inability of its retina to process high speed motion stimulation, similar to reaction of the human eye to an airplane propeller spinning faster and faster until it becomes virtually transparent. Motion smear occurs primarily at the tips of the wind turbine blades, making them deceptively transparent at high velocities. This increases the possibility that a bird could fly through this arc, get struck by a blade, and be killed (USFWS, 2003).

The USFWS has issued guidance for wildlife biologists and wind developers on ways to avoid and reduce mortality to birds and bats from WTGs (USFWS, 2003). The USFWS’s site development recommendations follow, along with HGS-specific comments (in italics).

1. Avoid placing turbines in documented locations of any species of wildlife, fish, or plant protected under the federal Endangered Species Act. *No federally listed species are documented at the proposed location of the four proposed WTGs on the Salem site*.
2. Avoid locating turbines in known local bird migration pathways or in areas where birds are highly concentrated, unless mortality risk is low (e.g., birds present rarely enter the rotor-swept area). Examples of high concentration areas for birds are wetlands, state or federal refuges, private duck clubs, staging areas, rookeries, leks, roosts, riparian areas along streams, and landfills. Avoid known daily movement flyways (e.g., between roosting and feeding areas) and areas with a high incidence of fog, mist, low cloud ceilings, and low visibility. *The proposed location is not located within any known local bird migration pathway or area of bird concentration.*
3. Avoid placing turbines near known bat hibernation, breeding, and maternity/nursery colonies, in migration corridors, or in flight paths between colonies and feeding areas. *The proposed location is not located near any known bat hibernation or breeding area, or within a migration pathway.*
4. Configure turbine locations to avoid areas or features of the landscape known to attract raptors (hawks, falcons, eagles, owls). For example, Golden Eagles, hawks, and falcons use cliff/rim edges extensively; setbacks from these edges may reduce mortality. Other examples include not locating turbines in a dip or pass in a ridge, or in or near prairie dog colonies. *The landscape where the WTGs would be located does not contain features known to attract raptors.*
5. Configure turbine arrays to avoid potential avian mortality where feasible. For example, group turbines rather than spreading them widely, and orient rows of turbines parallel to known bird movements, thereby decreasing the potential for bird strikes. Implement appropriate storm water management practices that do not create attractions for birds, and maintain contiguous habitat for area-sensitive species (e.g., Sage Grouse). *The orientation of the proposed turbine configuration at the Salem site in comparison with the predominant direction of bird movements locally is unknown.*

6. Avoid fragmenting large, contiguous tracts of wildlife habitat. Where practical, place turbines on lands already altered or cultivated, and away from areas of intact and healthy native habitats. If not practical, select fragmented or degraded habitats over relatively intact areas. *The HGS wind turbines would be installed on cultivated farmland and thus would not fragment wildlife habitat.*
7. Avoid placing turbines in habitat known to be occupied by prairie grouse or other species that exhibit extreme avoidance of vertical features and/or structural habitat fragmentation. In known prairie grouse habitat, avoid placing turbines within 5 miles of known leks (communal pair formation grounds). *The proposed farmland location of the HGS WTGs is not known to be occupied by prairie grouse but these could occur nearby.*
8. Minimize roads, fences, and other infrastructure. All infrastructure should be capable of withstanding periodic burning of vegetation, as natural fires or controlled burns are necessary for maintaining most prairie habitats. *The proposed wind turbine development at the HGS site would comply with this guideline*.
9. Develop a habitat restoration plan for the proposed site that avoids or minimizes negative impacts on vulnerable wildlife while maintaining or enhancing habitat values for other species. For example, avoid attracting high densities of prey animals (rodents, rabbits, etc.) used by raptors. *A habitat restoration plan would not be necessary because wildlife habitat would not be disrupted. Landscaping would take place to restore vegetation and soil cover after excavation and construction are complete.*
10. Reduce availability of carrion by practicing responsible animal husbandry (removing carcasses, fencing out cattle, etc.) to avoid attracting Golden Eagles and other raptors. *Carrion is not expected to be available near the HGS wind turbines. However, animals may be killed by coal supply trains on the railroad spurs associated with and in the vicinity of the power plant and wind turbines. SMC would need to remove these kills to prevent attracting Golden Eagles and other raptors.*

Considering the above landscape and site development issues, the relatively small scale of the proposed HGS wind development, the proposed design of the WTGs and the low quality of wildlife habitat present on site, the proposed HGS wind development would likely have minor to moderate impacts on wildlife, especially birds. These impacts would be localized and of long-term duration.

4.6.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

As described in Chapter 3, the alternative Industrial Park plant site appears to have been cultivated at some time in the past, but is currently vegetated in a mixture of grasses that includes smooth brome, crested wheatgrass, thickspike wheatgrass, and Kentucky bluegrass, as well as a variety of weedy forbs. Parts of this site have already been disturbed by human activities apparently associated with other developments in the industrial park. Wildlife species recorded during the biological survey at the site included the western meadowlark, unidentified vole (probably the meadow vole), Richardson's ground squirrel and badger.

Construction of the SME generating station at this site would entail negligible to at most minor adverse impacts on wildlife habitat on the site itself. It would not be expected to have any adverse impacts on threatened and endangered species or state species of special concern at the

site itself. Of greater possible concern would be temporary construction-related and long-term or permanent impacts on the biological resources as-yet unselected transmission, pipeline, and rail spur corridors

Impacts to habitat and wildlife from constructing transmission lines, the rail spur, the raw water intake and line, and potable water and sewage lines to the Industrial Park site would likely be short-term, localized, and negligible to minor in magnitude. If this site were to be selected, most of these utility connections would be shorter than for the Salem site due to closer proximity to established infrastructure. However, connection lines for water, wastewater, railroad transport, and electric transmission lines to the plant site could potentially have some adverse effects on biological resources. Since water, wastewater, and transmission lines are buried and elevated respectively, their installation would entail at most temporary and short-term impacts on possible wildlife habitat, since this habitat could be restored on the surface within the corridor; in contrast, a rail spur could potentially eliminate a small amount of habitat equal to the length of the track and bed times the width, as well as fragment habitats. However, most of area through which the spur is likely to pass has long been disturbed. If the Industrial Park site were to be selected instead of the Salem site, the same general biological mitigation measures would apply with regard to constructing utilities infrastructure.

4.6.4 CONCLUSION

Table 4-13 lists the impacts on biological resources resulting from the site preparation, construction, operation, and connected actions associated with a dam, reservoir, and raw water transmission main for each of the alternative project sites, including the No Action alternative.

Overall, the No Action Alternative would have no direct effects on biological resources at either of the proposed sites. However, it would contribute indirectly and cumulatively to adverse impacts on biological resources in other parts of the region, from SME's purchase of power from unspecified generating sources.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Aquatic Biological Resources Degradation" and "Terrestrial Biological Resources Degradation" in Appendix J, the biological impacts of the Proposed Action would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. Overall then, the rating for biological resources impacts from the Proposed Action would be adverse and non-significant.

The biological impacts of the Industrial Park site would be of minor magnitude, long-term duration, and small, and have a probable likelihood of occurring. Overall then, the rating for biological resources impacts from the alternative site would be adverse, but although impacts would most likely be non-significant, there is some potential for the impacts to become significant. The caveat for the analysis of the Industrial Park site alternative is that this rating must be considered preliminary, in that specific routes and corridors for transmission lines, pipelines, and the rail spur have not yet been selected. However, given the generally developed and disturbed habitats of the area as well as the nature of the proposed developments, any biological impacts from this alternative are likely to be at most minor.

Table 4-13. Summary of Direct Impacts on Biological Resources		
Alternative	**Impacts**	**Rating of Impacts**
No Action	• The No Action alternative would not change any land use or disturb existing habitat, and therefore would not have a direct adverse effect on biological resources.	• None
Highwood Generating Station - Salem site	• Temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment; • Eliminate potential habitats, but unlikely to adversely affect, state-listed species of concern from permanent removal of vegetation; • Short-term harm to wildlife/vegetation by degrading air quality; • Short-term harm to aquatic biota from degraded water quality; • Long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on access road; • Increase mortality to birds and bats from blade strikes on wind turbines; • Temporarily disturb habitats along water & power line routes during construction activities; • Temporarily or permanently disturb wetland habitats for installation of water intake; • Contribute to the potential spread of noxious weeds by disturbing existing vegetation cover and soils.	• Negligible • Negligible to minor • Negligible • Minor • Minor • Minor • Minor • Minor • Minor
Industrial Site	• Temporarily displace terrestrial wildlife due to removal of vegetation and disturbance from construction equipment; • Eliminate potential habitats, but unlikely to adversely affect, state-listed species of concern from permanent removal of vegetation; • Short-term harm to wildlife/vegetation by degrading air quality; • Damage habitat along water pipeline and power line routes during construction activities; • Contribute to the potential spread of noxious weeds by disturbing existing vegetation cover and soils.	• Negligible • Negligible • Negligible • Minor • Minor

4.6.5 MITIGATION

Mitigation measures are suggested primarily for the Salem site but some would apply to the Industrial Park site (or at least its utilities corridors) as well, except for measures related to the wind turbines; no mitigation measures are likely to be necessary for the highly disturbed, developed Industrial Park site itself. Less specific information was developed regarding biological resources on the various utilities corridors connecting to the Industrial Park site, but many of the measures suggested for the Salem site may be applicable.

Threatened and Endangered Species

Activities conducted by the contractor such as developing aggregate sources, gravel crushing, locating staging and stockpile sites could be conducted outside of the project limits and closer to the nests of bald eagles along the Missouri River. The Montana Bald Eagle Management Plan places limitations on these high intensity activities. They should not be conducted within 0.5 mile (0.8 km) of the Morony Dam nest location or any other known bald eagle nests between March 1 and May 15, or within (0.25 mile (0.4 km) of nest sites from May 15 to July 15. If the contractor anticipates any construction operations within the vicinity of an active bald eagle nest, roost site, or seasonal concentration area, or has any questions concerning the application of the regulations promulgated to protect this species, they should contact the USFWS and/or MFWP. These agencies can identify any restrictions that may apply to project planning, anticipated construction activities, and project scheduling.

State Species of Concern

Avoiding or minimizing disturbance of shrub, tree, and wetland habitats would reduce adverse effects on raptors and breeding bird species by the proposed project. If these habitats must be removed, disturbed, or altered for construction or maintenance of the proposed project or infrastructure, a pre-construction reconnaissance could be conducted to determine, to the extent practicable, the relative importance of such habitats to state species of concern. Disturbance of any such sites/habitats of importance to these species groups could be mitigated through the use of reasonable timing constraints during construction, reclamation/restoration of disturbed sites, or other appropriate measures.

Power Lines

Mitigation for birds of prey in the project area would include raptor-proofing all power poles that are to be erected or relocated for the proposed plant site and/or infrastructure. SME and its contractors should follow the “Suggested Practices for Raptor Protection of Power Lines”, Edison Electric Institute (EEI, 1996) or other appropriate guidance or recommendations for proper techniques.

Aquatic Resources

Since the Morony Reservoir is being used by MFWP to rear sauger, a state species of concern, SME will consult with MFWP on methods to minimize the impact of construction and maintenance of the raw water intake on sauger. Consultation with MFWP for this managed population would insure that construction and maintenance activities take place during appropriate seasons, and ensure that any turbidity, dewatering, or entrainment problems do not affect sauger.

In general for protection of fish species, it would be necessary to install adequate screening on the raw water intake to prevent death or injury to fish in the Morony Reservoir. The recommended state and federal permitting processes would address mitigation for affected resources.

Wind Turbines

The following recommended mitigation measures concerning wind turbine design and operation are derived from the U.S Fish and Wildlife Service's 2003 guidelines on minimizing impacts to wildlife from WTGs (USFWS, 2003).

- Use tubular supports with pointed tops rather than lattice supports to minimize bird perching and nesting opportunities.
- Avoid placing external ladders and platforms on tubular towers to minimize perching and nesting.
- Avoid use of guy wires for turbine or meteorological tower supports.
- If the turbines require lights for aviation safety, the minimum amount of pilot warning and obstruction avoidance lighting specified by the Federal Aviation Administration (FAA) should be used.
- Unless otherwise requested by the FAA, only white strobe lights should be used at night, and these should be the minimum number, minimum intensity, and minimum number of flashes per minute (longest duration between flashes) allowable by the FAA.
- Solid red or pulsating red incandescent lights should not be used, as they appear to attract night-migrating birds at a much higher rate than white strobe lights.
- If feasible, place electric power lines underground or on the surface as insulated, shielded wire to avoid electrocution of birds.
- Use recommendations of the Avian Power Line Interaction Committee for any required above-ground lines, transformers, or conductors.
- Follow USFWS guidance (USFWS, 2003) and protocols to monitor bird and bat mortalities. If after three years, monitoring demonstrates that bird and bat mortalities are not substantial, monitoring may be ended or modified in consultation with the appropriate regulatory agencies.

Carrion Removal from Railroad Spur and Access Roads

SME will monitor all established roads, as well as the railroad, within 1.0 mile of the wind turbines a minimum of once every two weeks, and will remove all carrion that are equal to or larger than a rabbit in size to a disposal site at least one mile from the turbines.

Noxious Weeds

SME would follow the requirements identified in the Cascade County Weed and Mosquito Management District's document, "Weed Management and Revegetation Requirements for Disturbed Areas in Cascade County, Montana." This document specifies the actions that need to be taken prior to disturbance, during operation, and upon reclamation, to prevent the spread of noxious weeds in the county.

4.7 ACOUSTIC ENVIRONMENT

For the noise analysis of the Proposed Action, acoustical consultants BSA used typical noise level data related to the construction and operation activities of a 250-MW coal-fired power plant. Noise generated by the power plant under the Salem and Industrial Park alternatives would vary in frequency and intensity during construction and operation activities. Although the power plant design is not complete, BSA evaluated a preliminary list of equipment and noise levels based on similar facilities (BSA, 2005; BSA, 2007).

During the construction of the power plant, noise would be produced by heavy equipment (e.g., scrapers, bulldozers, graders, loaders, dump trucks, pneumatic hammers), and building construction equipment (e.g., saws, drills, compressors, hammers, welding, etc.). Noise produced by diesel-powered equipment is typically 85 dBA at a distance of 50 feet (15 m) from the equipment (FTA, 1995). However, the noise of individual pieces of equipment can vary considerably depending on age, condition, manufacturer, use, and a changing distance from the equipment to a receptor location. Operation of the equipment also would vary considerably throughout the construction phase and from day to day. Although construction noise may be audible at a receptor located within several miles, construction activities and noise would be temporary and short-term compared to the operations of the proposed power plant.

Near the end of the construction phase, the steam lines of the plant must be thoroughly cleaned before the plant could begin operation by using high-pressure steam that would be blown out to the atmosphere. Although the noise produced by a steam blow-out varies due to stream pressure, temperature and moisture, the size and shape of the vent opening and the valve used, the noise of steam blow outs are typically 80 to 95 dBA at 1,000 feet (305 m) and last for several minutes.

The primary noise sources associated with the daily operation of the power plant would include transformers, primary air fans (PA fans), secondary air fans (SA fans), two induced draft fans (ID fans), a cooling tower (seven towers in array), a turbine, a boiler, and a coal crusher (EEI, 1984; Stanley, 2005a; Stanley 2005b). For this analysis, the noise levels created by a typical 250-MW coal-fired power plant were evaluated per the criteria cited in Section 4.2.2 and Appendix J of this EIS.

During initial start-up of the plant and restart operations after maintenance shutdowns, high-pressure steam would be intermittently discharged to the atmosphere. Although the noise produced by a steam vent would vary, the noise of start-up steam vents would be typically 75-80 dBA at 1,000 feet (305 m).

Brief and intermittent trips along the roads leading to either site would not significantly affect the L_{dn} value at a receptor, and therefore, the road traffic was evaluated separately. Assuming, worst case, that 55-60 employee vehicles and six heavy trucks transporting limestone travel the roads during the same hour at approximately 35 miles (56 km) per hour, the estimated noise level at 50 feet (15 m) from the road would be approximately L_{eq}(h) 56 dBA (FHWA, 1998). Noise of individual trucks might be audible within approximately 1-2 miles of the road (BSA, 2005).

Coal would be brought to the power plant using two trains per week, and would typically consist of 110 cars per train. Diesel locomotives typically are 87 to 96 dBA at 100 feet (30 m) from the track (Harris, 1998). For the prediction of the power plant noise levels, BSA assumed that one train would deliver coal to the plant during daytime hours and would travel at approximately 5-10 miles (16 km) per hour around the site. Although a single train during the day would not significantly affect the L_{dn} value near the tracks, the brief, intermittent noise of the diesel locomotives passing by can significantly exceed existing ambient levels at a receptor during the pass-by and be audible for several miles.

ID fans used in power plants can produce distinct, and typically annoying, audible tones intermittently at certain operating conditions of the fan and inlet dampers. The fans produce tones at the blade pass frequency of the fan, typically during partial-load operation, but the level of the resulting tone cannot be accurately predicted (EEI, 1984). The preliminary ID fan selection for the proposed power plant would have 12 blades and would operate at 1180 rpm. Using these data, BSA calculated the blade pass frequency of this preliminary fan would be at approximately 236 Hertz, and added 10 dB to the blade pass frequency of the typical ID fan data used for the calculations (EEI, 1984).

Using the Cadna-A Version 3.5 noise prediction software from DataKustik, BSA developed noise level contours for the combined typical power plant equipment and train operations at both the Salem and Industrial Park sites. This standard specifies the calculations to determine the reduction in noise levels due to the distance between the noise source and the receiver, the effect of the ground on the propagation of sound, and the effectiveness of natural barriers due to grade or man-made barriers such as walls. The calculations conservatively assume that the atmospheric conditions are favorable for sound propagation.

4.7.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no power plant would be constructed at either the Salem or Industrial Park sites to meet SME's projected base load needs. Rather, SME would purchase electricity from existing generation sources in the Northern Rockies or Pacific Northwest, which could be a mix of large-scale hydro, natural gas, coal, nuclear, and to a smaller extent, wind, solar, and other renewables. Under this alternative, during the immediate future, the acoustical environments of both the Salem and Industrial Park sites would be expected to remain much as they are at present.

Around the Salem site, L_{90} ambient short-term noise levels would continue to range from about 20 to 47 dBA, a range characteristic of rural or agricultural settings. The L_{90} ambient noise levels would continue in the 18 to 35 dBA range from 8:00 p.m. to 8.00 a.m., which is also typical of quiet rural environments at night. The overall L_{dn} at the Salem site would remain approximately 47 dBA, what it is today, with an estimated L_{dn} of 30 dBA during quiet periods. The acoustic environment of the Salem site would continue to be representative of a rural, agricultural area.

During the immediate future, around the Industrial Park site, noise levels would continue to range from about L_{90} 28 to 44 dBA, higher than the Salem site because of nearby traffic. The L_{90}

ambient noise levels would continue in the 36 to 45 dBA range from 8:00 p.m. to 8:00 a.m., typical of quiet suburban areas at night. The overall L_{dn} at the Industrial Park site would remain about 53 dBA, what it is today, with an estimated L_{dn} of 45 dBA during quiet periods. The noise profile of the Industrial Park site would continue to reflect that of an outer suburb on the edge of town, roads and an industrial area. However, unlike the Salem site, which is likely to remain rural, agricultural and thinly populated for the foreseeable future, the Industrial Park site is in an area that is undergoing development, both residentially and industrially. These developments would raise overall noise levels (expressed as L_{dn}) in the vicinity over the coming years.

The No Action Alternative would not contribute directly to noise at either the Salem or Industrial Park sites. However, by purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to ongoing noise impacts at existing generating stations in the region. To the extent that expanding demand for electricity in the wider region drives construction of new generating facilities elsewhere, SME would be contributing indirectly to noise impacts associated with construction and operation of those facilities.

4.7.2 PROPOSED ACTION – HGS AT THE SALEM SITE

As described in Chapter 3, approximately eight scattered rural residences are located within three miles (5 km) of the Salem site. The closest residence is located approximately one mile (1.6 km) northwest and is owned by the current property owner of the Salem site. A Lewis and Clark Interpretative Site (i.e., the Portage Staging Area), which interprets the Great Falls Portage NHL, is located approximately 1.75 miles (2.8 km) north of the Salem site. Onsite, human noise-sensitive receptors would be the power plant workers. Wildlife (e.g., deer, antelope, birds, etc.) that live, forage, and pass through the site area are also noise-sensitive receptors.

Figure 4-4 shows the predicted L_{dn} noise level contours for the power plant and train operations overlaid on a USGS topographic map for the Salem site. As the figure reveals, the noise levels are not predicted to radiate equally in all directions. Noise contours were developed assuming that all the power plant equipment operated 24 hours per day and includes the effect of one coal delivery train traveling to the site during the day. The noise contours that are equal to the estimated quiet ambient noise levels at the Salem site (Table 3-15) are shown for reference in the figure. However, since the predicted power plant noise would be typically a low-frequency hum and the measured existing ambient level around the site was influenced by high-frequency insect noise, the plant might still be audible during quiet periods beyond the location of the estimated quiet ambient noise contour shown on Figure 4-4.

The Salem site noise contours and receptors are shown in Figure 4-4, while the predicted noise levels at the receptors are listed in Table 4-14. The EPA L_{dn} 55 dBA guideline is predicted to be met within 0.6 mile (1 km) of the plant location and 0.5 mile of the wind turbines. The measured existing ambient noise level of L_{dn} 47 dBA is predicted to be met within approximately 1.2 miles (1.9 km) of the Salem site, and the estimated quiet ambient noise level of L_{dn} 30 dBA is predicted to be met within approximately 3.1 miles (5 km). As shown in Table 4-14, the typical L_{eq} noise levels of the plant are predicted to be less than the 50 dBA nighttime residential noise limit of the Great Falls Municipal Code for residences (Table 3-16) at all of the receptor locations, and the

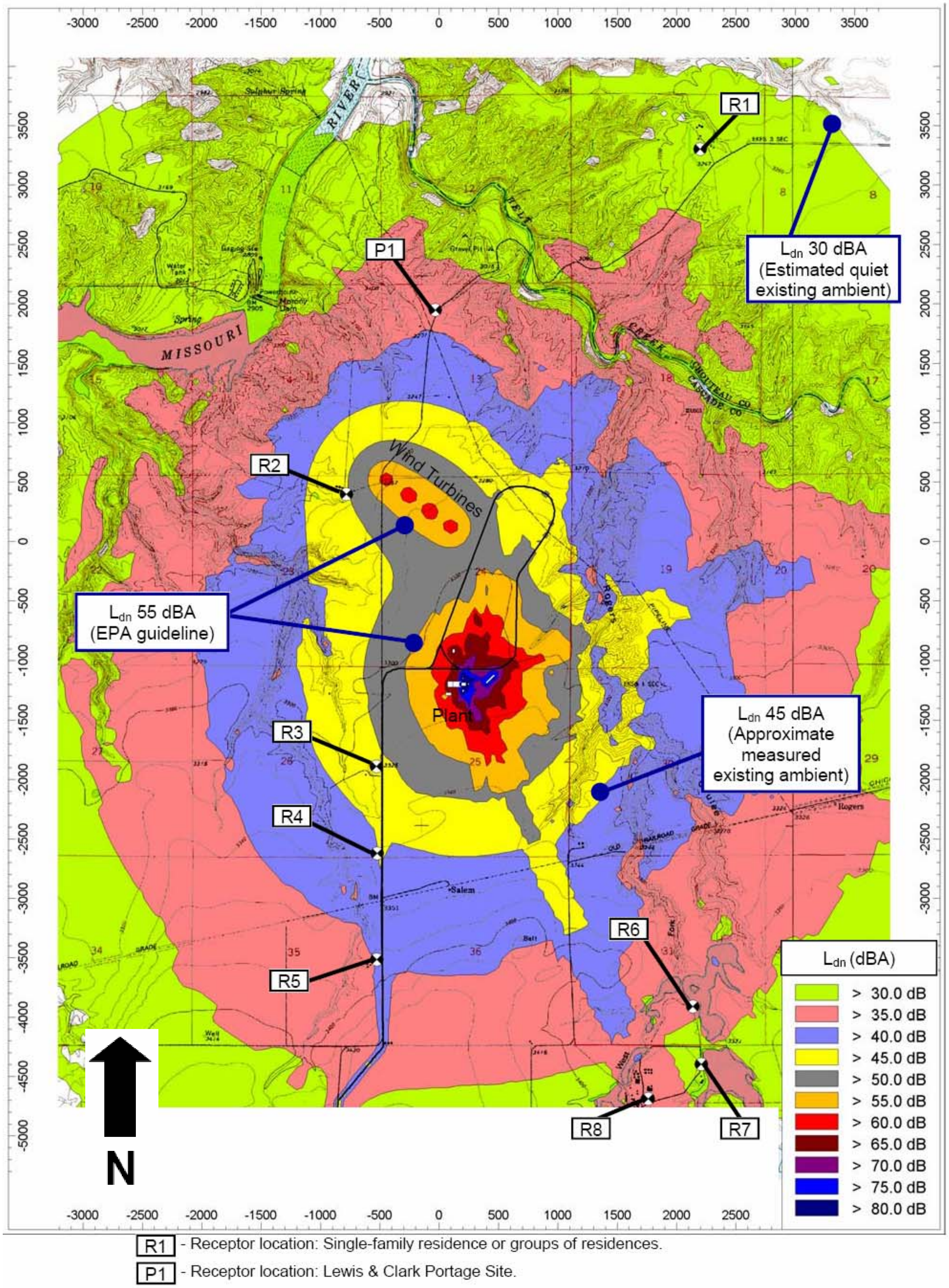


Figure 4-4. HGS L_{dn} Noise Contours at Salem Site

Source: BSA, 2007

Table 4-14. Predicted Noise Levels at Nearby Receptors – Salem Site

Receptor Locations	Type of Receptor	Noise Level L_{eq} (dBA)	Noise Level L_{dn} (dBA)
R1	Single-family residence	28	34
P1	Lewis and Clark Interpretive Site (i.e., Portage Staging Area)	30	37
R2	Single-family residence	44	51
R3	Single-family residence	44	50
R4	Single-family residence	41	45
R5	Single-family residence	39	42
R6	Single-family residence	30	37
R7	3 single-family residences	28	35
R8	Single-family residence	32	38

Source: BSA, 2007

typical L_{dn} noise levels are predicted to be less than or equal to the L_{dn} 55 dBA EPA guideline at all the receptor locations.

On-site workers, nearby residents, as well as wildlife, would be exposed to various noise sources during the construction and operation activities. Noise-induced hearing loss is the primary effect of exposure to excessive noise. Federal workplace standards for protection from hearing loss allow time-weighted average level of 90 dBA over an 8-hour period, 85 dBA averaged over a 16-hour period and 70 dBA over a 24-hour period. The primary human effect due to prolonged noise would be annoyance. Other non-auditory human effects include speech interference, stress reactions, sleep interference, lower morale, efficiency reduction, and fatigue (Harris, 1998).

Numerous studies have been conducted attempting to document the effects of noise on wildlife. Wildlife responses to noise vary considerably and are a function of many other variables besides noise, including the characteristics of the noise and its duration, life history characteristics of the species, habitat type, season and current activity of the animal, sex, age, previous noise exposure, as well as other physical stressors such as drought (CST, 1996). General wildlife responses to human-made noise are attraction, tolerance and aversion, which are summarized in the following list of potential responses (CST, 1996; EPA, 1971; Bowles, 1995).

- Most animals habituate to sounds (e.g., truck and equipment noise) disassociated with other threatening stimuli.
- Animals (e.g., ungulates) that habituate to traffic noise are vulnerable to oncoming vehicles.
- Steady sounds are less prone to startle animals than sudden onset noise.
- Human-made noise can mask meaningful noise (e.g., mating and other communication).
- Motivation to find food can make animals tolerant of noise.
- Different species have different levels of noise tolerance and habituation.
- Most effects of noisy disturbances are mild enough that they may never be detectable as changes in population size or population growth.
- Animal aversion is measured in avoidance responses and can be lessened if animals can predict exposure (e.g., warning signal before conveyor startup).

Wind turbine design modifications such as orienting rotors to face upwind have reduced noise from even larger turbines like those proposed at the Salem site (AWEA, no date). Big Sky Acoustics LLC has prepared noise level predictions for the proposed wind turbine generators associated with the HGS (BSA, 2006). BSA developed noise level contours for the combined noise of the coal-fired power plant equipment and the four proposed wind turbine generators. The noise prediction model and assumptions for the Salem Site (BSA, 2005) was modified to include the wind turbines. For the analysis, it was assumed that all four wind turbines and the power plant were operating simultaneously and continuously during a 24-hour period. This assumption should be considered conservative because the operation of the wind turbines would vary with the wind speed at the site. The octave-band sound power levels associated with a wind speed of 8 meters per second (18 mph) at 10 meters (33 feet) above the ground were used for the calculations as a representative wind speed (BSA, 2006).

The L_{eq} noise levels at the receptor locations due to the combination of the power plant and the wind turbines are predicted to be between 0 and 1 dBA greater than the noise levels predicted for the power plant only. The L_{dn} noise levels at the receptors due to the power plant and wind turbines are predicted to be 0 to 2 dBA greater than the noise levels predicted for the power plant only. Therefore, the dominant noise source(s) associated with the project would be the power plant equipment, and not the wind turbines (BSA, 2006).

4.7.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

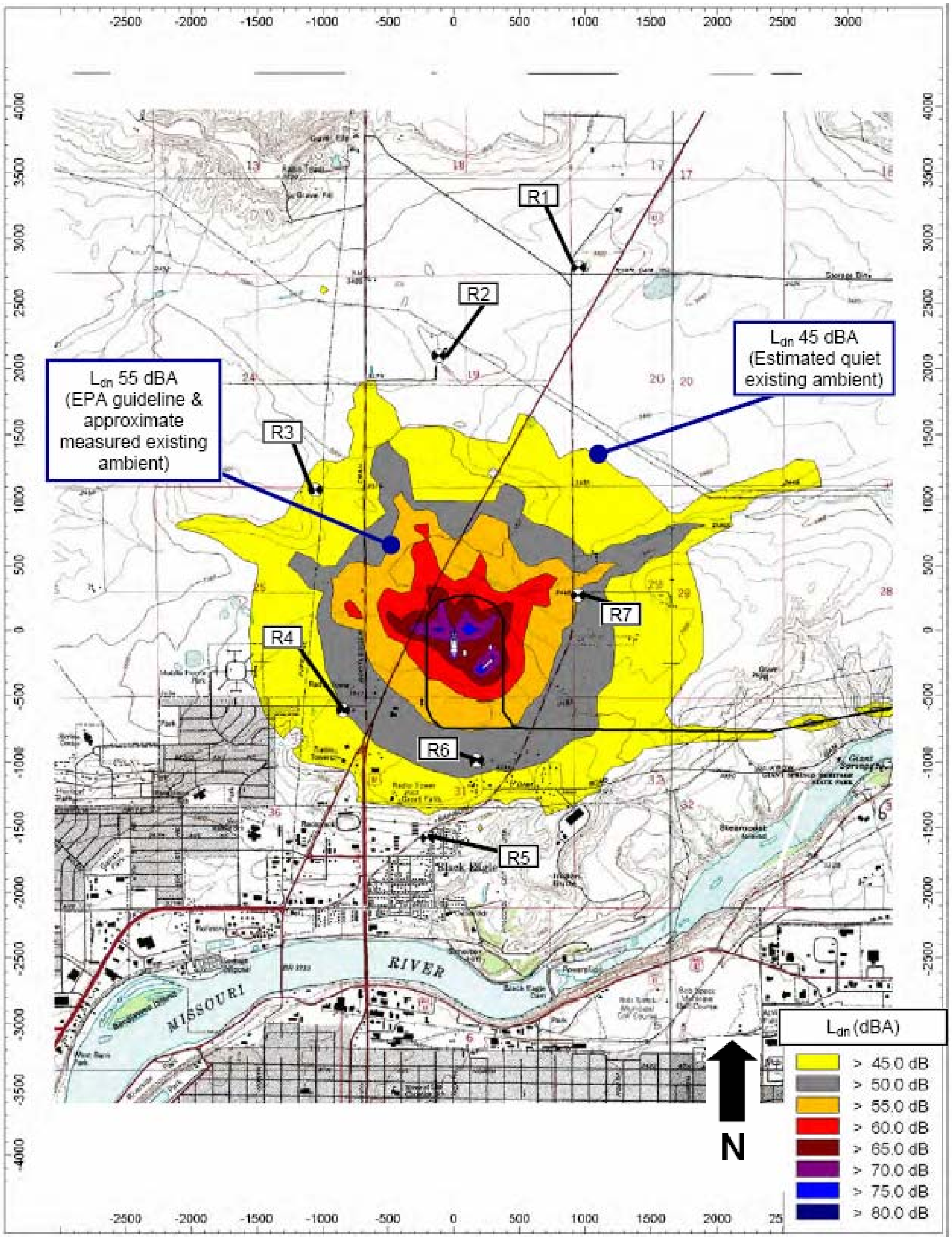
As described in Chapter 3, approximately seven groups of residences are located within one mile (1.6 km) of the Industrial Park site, primarily off of Black Eagle Road, Rainbow Dam Road, and Bootlegger Trail. Onsite, human noise-sensitive receptors would be the power plant workers.

The Industrial Park site noise contours and receptors are shown in Figure 4-5, and the predicted noise levels at the receptors are listed in Table 4-13. The EPA L_{dn} 55 dBA guideline is predicted to be met within 0.7 mile (1.1 km) from the Industrial Park site. The measured existing ambient noise level of L_{dn} 53 dBA (Table 3-16) is predicted to be met within approximately 0.8 mile (1.3 km) of the Industrial Park site and the estimated quiet ambient noise level of L_{dn} 45 dBA (Table 3-16) is predicted to be met within approximately 1.2 miles (1.9 km) (Figure 4-5). As shown in Table 4-11, the typical L_{eq} noise levels of the plant are predicted to be less than the 50 dBA nighttime residential noise limit of the Great Falls Municipal Code for residences (Table 3-13) at all of the receptor locations, and the typical L_{dn} noise levels are predicted to be less than the L_{dn} 55 dBA EPA guideline at all the receptor locations (Table 4-15).

4.7.4 CONCLUSION

The No Action Alternative would not result in any direct noise impacts on either the Salem or Industrial Park sites, though it would contribute indirectly to noise impacts at those power plants from which SME would purchase electricity.

<u>While noise contours expected at the two alternate sites would be similar, because of the presence of the NHL, HGS would entail a significant, adverse effect on the acoustic environment while the Industrial Park site would result in minor adverse, non-significant impacts.</u>



R1 - Receptor location: Single-family residence or groups of residences.

Figure 4-5. HGS L_{dn} Noise Contours at Industrial Park Site
Source: BSA, 2005

Table 4-15. Predicted Noise Levels at Nearby Receptors – Industrial Park Site

Receptor Locations	Type of Receptor	Noise Level L_{eq} (dBA)	Noise Level L_{dn} (dBA)
R1	Single-family residence	34	41
R2	Single-family residence	35	42
R3	Group of single-family residences	39	46
R4	Group of single-family residences	43	50
R5	Group of single-family residences	36	42
R6	Group of single-family residences	45	52
R7	Group of single-family residences	47	54

Source: BSA, 2005

Noise levels associated with the daily operation of a typical 250-MW coal-fired power plant would be primarily determined by the Induced Draft fans, Primary Air fans, Secondary Air fans, transformers, cooling tower, turbine, boiler, coal crusher and trains for coal delivery. Intermittent noise sources associated with the power plant that would not significantly affect the daily operation L_{dn} but could be audible for several miles from the site, including steam line cleaning, start-up steam vents, tonal noise produced by the ID fans, and locomotives used to deliver coal.

The noise levels of typical daily plant operations are not predicted to exceed the EPA guideline of L_{dn} 55 dBA beyond 0.6 mile (1 km) from the Salem site and 0.7 mile (1.1 km) from the Industrial Park site. The predicted noise levels are equal to or less than the EPA guideline at the receptor locations around each site, but do not radiate equally in all directions.

Noise levels are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 3.1 miles (5 km) from the Salem site and 1.2 miles (1.9 km) from the Industrial Park site. However, because the predicted power plant noise is typically a low-frequency hum and the measured existing ambient levels around both sites were influenced by high-frequency insect noise, the plant may still be audible during quiet periods beyond the location of the estimated quiet ambient noise contours shown on the figures.

At all of the receptor locations as defined in of this report, the power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA L_{dn} 55 dBA guideline. Employee vehicle traffic and delivery truck noise is predicted to be less than MDT's L_{eq}(h) 66 dBA impact criteria at 50 feet (15 m) from the road. Therefore, the overall results indicate that the noise levels associated with a typical 250-MW coal-fired power plant are predicted to be within applicable noise guidelines and ordinances at the receptor locations near the Salem and Industrial Park sites.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for Noise Impacts in Appendix J, acoustic impacts of the proposed HGS and wind turbines at the Salem site would be considered of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. However, because of NPS policies to preserve the environment of the areas it administers, such as the surrounding Great Falls Portage NHL at the Salem site, any degradation of the existing natural (or rural) ambient soundscape, such as that represented by HGS construction and operation, would be considered significantly adverse.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for Noise Impacts in Appendix J, acoustic impacts of building and operating a 250-MW power plant at the Industrial Park site would be of minor magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. Overall then, the rating for noise impacts at the alternative Industrial Park would be adverse, but while impacts would most likely be non-significant, there is some potential for the impacts to become significant. As shown in Table 4-13, predicted noise levels at residential receptors near the Industrial Park site are greater than those predicted for the Salem site, but probably not enough to cause a significant adverse impact.

4.7.5 MITIGATION

While one significant, adverse noise impact is anticipated on the acoustic environment of the NHL, no mitigation measures are planned or proposed for either of the action alternatives.

4.8 RECREATION

4.8.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired generating station would be constructed at either the Salem or Industrial Park sites. In addition, no 230-kV electrical transmission line interconnections would be developed in the Great Falls area. Thus, there would be no direct impacts on recreation from the No Action Alternative. That is, there would be no direct impacts on recreational facilities, recreational opportunities, or the quality of recreational experiences in the Great Falls area.

However, SME would need to purchase power from another generation source within the Western System Coordination Council (WSCC) to meet its projected baseload needs beginning in 2008. If generation and transmission capacity have to be expanded to meet a general growth in load to which SME would contribute, SME could be contributing indirectly and incrementally to the impacts on recreation that occur at other locations in the Rocky Mountain West and Pacific Northwest. Depending on the type of generation (e.g., hydro, coal, natural gas, wind, solar, nuclear, geothermal) as well as the specific location of that generation and related transmission, a wide variety of impacts could occur on recreation facilities, opportunities, and recreational quality, ranging from effects on fishing, hunting, hiking, camping, access, visual resources, and cultural resources. Most but not all of these impacts would be adverse.

4.8.2 PROPOSED ACTION – HGS AT THE SALEM SITE

Construction and operation of the HGS at the preferred Salem site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. As indicated in Section 3.7, there are no recreational facilities or activities present on the Salem site itself. There is one recreational/cultural/educational site in the immediate vicinity that would be impacted by the Proposed Action: the Lewis and Clark staging area historic site. This is a site for heritage recreation/tourism. It appears to receive relatively little visitation or public use

at present. While the Proposed Action would not restrict access to it, during construction such access might be made more difficult because of heavy construction traffic.

The presence of the power plant 1.75 miles (2.8 km) to the south of the Lewis and Clark interpretive site would degrade the recreational experience there to some extent for the few visitors the site receives. The open vista and relatively empty landscape would no longer appear so open and empty, at least looking toward the south, with the prominent presence of the power plant (discussed both under visual resources and cultural resources sections) and additional transmission lines in the area. In addition, noise levels at the staging area historic site would be slightly elevated over background levels (see Section 4.8.2). However, neither the staging area historic site, nor access to it, nor the educational message it conveys about the important historic event that occurred nearby two centuries ago, would be adversely affected by the Proposed Action.

Potential impacts of the Proposed Action to the quality of distant recreation opportunities in Class I national park and wilderness areas, as a result of its impacts on air quality and visibility, are discussed under air quality, Section 4.5.2.2.3. Potential impacts on recreational fisheries as a result of HGS's incremental contributions to mercury deposition in the state, and subsequent bioaccumulation in sport fish (and the need to limit human consumption), are anticipated to be negligible. Mercury is discussed at greater length in Section 4.5.2.2.4.

4.8.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

Construction and operation of the HGS at the alternative Industrial Park site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. As indicated in Section 3.7, there are no recreational facilities or activities present on the Industrial Park site itself; the site is an undeveloped, previously farmed portion of a designated industrial park.

The closest recreational facilities to the Industrial Park site that support high levels of recreation are several parks along the Missouri River, specifically, Giant Springs State Park, Lewis and Clark National Historic Trail Interpretive Center, and Elks Riverside Park, operated by the state, federal, and city governments, respectively. In addition, the River's Edge Trail, managed by a group of agencies and an NGO, runs along the Missouri, approaching within approximately a mile (1.6 km) of the proposed plant. As discussed in Section 4.11.3, upper portions of the proposed generating station would be visible to park visitors and recreationists along the river. However, given the already urban setting and the absence of a scenic background, the view of which the power plant could potentially detract from, its visual impact would be low.

4.8.4 CONCLUSION

The No Action Alternative would not result in any direct impacts on recreation facilities or opportunities at either the Salem or Industrial Park sites, though it would contribute indirectly to recreation impacts associated with those generating stations from which SME would purchase electricity.

Construction and operation of the HGS at the preferred Salem site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There is one recreational site in the immediate vicinity that would be impacted by the Proposed Action: the Lewis and Clark staging area interpretive site. The Proposed Action would not restrict access to either of these facilities, which appear to receive relatively little visitation or public use. The presence of the power plant 1.75 miles (2.8 km) to the south of the Lewis and Clark interpretive site would degrade the recreational experience there to some extent for the few visitors the site receives. Overall, the rating for recreation impacts from the Proposed Action would be adverse but non-significant.

Similarly, construction and operation of the SME power plant at the alternate Industrial Park site would entail negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There are no recreational facilities or activities present on the Industrial Park site itself, which is an undeveloped, previously farmed portion of a designated industrial park. Upper portions of the proposed generating station would be visible to park users and recreationists along the Missouri River in Great Falls. However, given the already urban setting and the absence of a scenic background, the view of which the power plant could potentially detract from, its visual impact for recreationists would be low. Overall then, while the rating for recreation impacts from the alternate Industrial Park site would be adverse, it would be non-significant.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Recreation Degradation" in Appendix J, the recreation impacts of the Proposed Action would be of minor magnitude, long-term duration, and small extent, and the likelihood would be probable. Overall then, the rating for recreation impacts from the Proposed Action would be adverse and non-significant.

The alternative Industrial Park site would be unlikely to cause other adverse impacts on local recreation in the Great Falls area. Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Recreation Degradation" in Appendix J, the recreation impacts of the Industrial Park alternative would be of minor magnitude, long-term duration, and small extent, and the likelihood would be probable. Overall then, the rating for recreation impacts from the alternative Industrial Park site would be adverse and non-significant.

4.8.5 MITIGATION MEASURES

At the Salem site, during construction, SME would attempt to accommodate ongoing access by motorists and visitors to the Lewis and Clark staging area historic site and the National Historic Landmark more generally.

Over the long term, after construction has been completed, SME would cooperate with the SHPO and local historic preservation interests to enhance the Lewis and Clark staging area interpretive site and Great Falls Portage NHL experience, as discussed further under Cultural Resources. Such enhancements may include those mitigation measures listed in Section 4.9.5 under Cultural Resources. At the Industrial Park site, no measures to mitigate recreation impacts would be necessary.

4.9 CULTURAL RESOURCES

4.9.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired generating station would be constructed at either the Salem or Industrial Park sites. In addition, no 230-kV electrical transmission line interconnections would be developed in the Great Falls area. Thus, there would be no direct impacts on cultural resources, including Traditional Cultural Properties, from the No Action Alternative.

However, SME would need to purchase power from another generation source within the WSCC to meet its projected baseload needs beginning in 2008. If generation and transmission capacity have to be expanded to meet a general growth in load to which SME would contribute, SME could be contributing indirectly and incrementally to the impacts on cultural resources that occur at other locations in the Rocky Mountain West and Pacific Northwest. Depending on the type of generation (e.g., hydro, coal, natural gas, wind, solar, nuclear, geothermal) as well as the specific location of that generation and related transmission, a wide range of adverse impacts of varying intensity could occur on cultural resources.

4.9.2 PROPOSED ACTION – HGS AT THE SALEM SITE

The proposed project is an undertaking as defined by 36 CFR 800, Protection of Historic Properties. Construction, maintaining, and operation of facilities in an area that contains historic properties could constitute an adverse effect on those properties. An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association.

An archaeological site consists of a definable spatial arrangement of cultural features, artifacts, or both, and can be either prehistoric or historic. Isolated finds are locations where few artifacts are noted or recovered, but which could not be defined as an archaeological site using the criteria defined by the Montana SHPO. For the purposes of Section 106/110 consultation and evaluations of eligibility for listing on the National Register of Historic Places (NRHP), a site must of sufficient age (50 years or older) to be considered an cultural resource property.

The potential impacts on cultural resources were derived from surveying the project area and Area of Potential Effect to determine whether any such cultural resources exist in these areas.

As stated previously, the cultural resource survey conducted in support of this EIS was a preliminary inventory and evaluation. It was conducted to identify historic properties within the surveyed portions of the proposed project areas and to determine the potential for significant historic properties to be located within the proposed project areas. In the event that a site discovered during the survey is considered potentially eligible for inclusion in the NRHP, Phase

II testing would be recommended for that site. Phase II testing is a more in-depth evaluation of identified cultural resources. Such a study would consist of the excavation of selected test units or areas to examine and evaluate on a more comprehensive basis the cultural property documented during the preliminary survey. The excavation would determine the possibility of intact, subsurface cultural deposits and/or features.

Additional archaeological work beyond the Phase II level would depend on the results of the Phase II excavations. If no intact buried deposits and/or features were identified, no additional work would be recommended. If such deposits were encountered, then additional work would be recommended prior to impacting or damaging the site by the project.

If the procedures implementing Section 106 of the NHPA, and other relevant Federal statutes are followed correctly, then the adverse effects on cultural resources could be mitigated. If the procedures were not followed, significant environmental consequences could occur. If potential historical properties were discovered during construction of the project, construction would be halted and the Montana SHPO would be contacted. Construction would not continue until proper investigation of the artifacts and resources could be conducted. In some cases where construction would occur in the immediate vicinity of known cultural resources, a planned cultural resource monitoring program would be prearranged. Such a stipulation would allow a qualified cultural resource professional to be on-site to deal with any inadvertent discoveries of cultural remains.

As described in Chapter 3 (Section 3.7), 10 cultural properties lie within the APE of SME's HGS Salem site. The ten include five previously recorded sites, and five discovered and recorded as part of investigations supporting this EIS. Of these 10 properties (listed in Table 3-17), only one would be impacted by the Proposed Action, the Great Falls Portage NHL (24CA238).

This NHL's integrity is based predominantly on the visual landscape qualities that are similar to that which existed during the early 19th century when the Corps of Discovery traveled through the area. While portions of the visual landscape qualities of the Great Falls Portage NHL are indeed similar to those which existed at the time of the Lewis and Clark expedition, other portions are not. In the vicinity of the NHL the visual landscape is quite changed, including damming of the Great Falls of the Missouri, development of the City of Great Falls, development of Malmstrom Air Force Base, development of numerous farmsteads and accompanying facilities, and installation of numerous transmission lines across the Missouri River.

Because of the specific situation of this NHL site, most of the facilities planned for the HGS at the Salem site present a high likelihood of negatively impacting the significant historic scene of the property (Figure 4-6). Mitigation of such impacts to the views of a relatively undeveloped landscape can be potentially addressed with creative design to assure the preservation of key resource and landscape views. Figure 4-6 is an artist's rendition of the HGS power plant superimposed on the landscape within the NHL while Figure 4-7 shows an existing view within the NHL that would remain unaffected by the construction of the power plant and wind turbines. As a result of concerns expressed by the historic preservation community after the release of the DEIS, and during the Section 106 consultation process – and as noted in Section 2.2.2 of this FEIS – the location of the HGS has been shifted about one-half mile toward the south to a

Figure 4-6. Artist's Rendition of HGS within Great Falls Portage NHL looking east toward Highwood Mountains

Figure 4-7. View of Open Landscape within NHL north of Proposed HGS, Looking North toward Missouri River; this view would remain unaffected by Proposed Action

location just outside the NHL boundary in an effort to reduce cultural resource impacts. The four wind turbines, however, would remain within the NHL because of space constraints within the property to be purchased by SME.

At the present time, it appears that no Traditional Cultural Properties at the Salem site would be impacted by the Proposed Action, as none have been identified.

4.9.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

Since no cultural resource properties or TCPs have been identified within the alternate site area, there would be no effects (adverse or otherwise) to cultural sites for construction, maintenance or operation of a plant in that specific location. However, connection lines for water, wastewater, railroad transport, and electric transmission lines to connect the plant site could adversely affect cultural resources, including the Great Falls Portage National Historic Landmark, although any such effects would not be as pronounced as in the case of the Proposed Action.

4.9.4 CONCLUSION

The following table lists the impacts on cultural resources resulting from the site preparation, construction, operation, and connected actions of the project, including the No Action Alternative.

Table 4-16. Impacts on Cultural Resources

Alternative	Impacts	Rating of Impacts
No Action	· No impacts	· No impacts
HGS and wind turbines with connecting lines at Salem site	· Adversely affect NHL and, possibly, other undiscovered cultural resources from site preparation, staging, construction, maintenance, operations, and connected actions associate with power plant, water lines, transmission lines, rail supply lines.	· Insignificant, through mitigation · Adverse impacts to Great Falls Portage NHL would be reduced through mitigation efforts (siting, landscaping, etc.), but would still be significant.
Industrial Park Alternate Site	· No effect to cultural resources within alternate site. · Connecting lines to GFIP alternate site would have same adverse effects as above.	· No impacts · Insignificant, through mitigation

The No Action Alternative would have no direct impacts on cultural resources at either the Salem or Industrial Park sites.

The Proposed Action would adversely affect cultural resources from site preparation, staging, construction, maintenance, operations, and connected actions associate with power plant, water lines, transmission lines, rail supply lines. Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Cultural/Archeological Resources Degradation" in Appendix J, cultural resource impacts of the HGS at the Salem site would be of major magnitude ("Disturbance of a site listed on or eligible for listing on the National Register of Historic Places or National Historic Landmark diminishes the significance or integrity of the site"), long-term duration ("Cultural resources are non-renewable; any adverse effect is permanent/long-term"), and medium or localized extent ("Part of a cultural resource or site is affected [5 to 50%]"), and the likelihood is probable. Overall then, the rating for cultural resources impacts from the Proposed Action would be significantly adverse. While representing an important commitment to minimize cultural resources impacts to the extent feasible, the proposed mitigation measures below would not be able to reduce them to below the threshold of significance.

At the alternative Industrial Park location, there would likely be no effect on cultural resources due to their apparent absence from the site. Connecting pipelines and power lines to the alternate site would likely have the same adverse effects as above for the Salem site.

4.9.5 MITIGATION MEASURES

If the procedures implementing Section 106 of the NHPA and other relevant federal statutes are followed correctly, then adverse effects on cultural resources can be mitigated. The Great Falls Portage National Historic Landmark exhibits extremely high levels of historic significance, mostly related to the natural landscape and views that remain very similar to those apparent in 1805. To this end, care should be taken to utilize creative design and facility siting techniques to assure the preservation of this unique resource. RUS and SME would work with the Montana SHPO, ACHP, and NPS to reduce impacts on the historic landscape and viewshed.

The additional nine historic sites recorded within the project area have been evaluated for their historic significance and integrity, resulting in recommendations for determinations of eligibility for listing on the NRHP. Prior to further design work for this project, the recommendations for eligibility, or determination of non-eligibility, should be presented to the Montana SHPO for consultation and possible consensus determinations.

Due to the potential for buried archaeological deposits in the various locations of the project area, and the potential that these deposits could be eligible for inclusion on the NRHP, it is recommended that a cultural resources monitoring program be established for all preparation, staging, and construction phases of the project. Similarly, an emergency discovery plan would be developed prior to commencing construction. Such a plan would address protocols and procedures for dealing with the inadvertent discovery of archaeological or buried human remains. The development of such a plan would be conducted in consultation with the Montana SHPO and interested Tribal representatives.

Given the documented pre-historic and historic presence of Blackfeet Indians in the general area, in the event that any cultural materials are discovered during excavation and construction for the HGS, SME and/or its contractors would immediately notify the Blackfeet Tribal Historic Preservation Office. Alternatively, a monitor from the tribe would be present during construction at SME's cost.

With regard to the specific issue of mitigating impacts on the NHL, the following proposed measures are under active consideration by SME, RUS, DEQ and the Section 106 consulting parties. Final commitments would be made at the time the Record of Decision is issued.

On-Site Avoidance, Minimization, and Mitigation:

SME would agree to perform all of the following measures, subject to a reasonable cap on expenditures that is the subject of the MOA attached to this EIS:

- Shift the footprint of the SME HGS outside of the NHL's designated boundaries. Because of space limitations, the wind turbines and certain aspects of HGS infrastructure (i.e., raw water line, transmission lines, possibly small part of rail or potable/waste water lines) would be placed on or cross the NHL.
- Maximize the use of downward directional lighting where appropriate and safety measures allow.
- Where feasible use of earth tone colors on any facilities.
- Evaluate whether it is feasible to utilize landscaping around the facility. SME has engaged a landscape architect to evaluate the feasibility of a variety of landscaping options and generate associated cost options. The options would be evaluated to determine whether landscaping is feasible, and cost effective in relation to other mitigation measures. (This is not a high priority in comparison to a focus on improving the viewshed of the Lewis and Clark Interpretative Center alongside the Missouri River.
- Construct HGS infrastructure using materials and techniques to lessen impacts on the NHL, such as use of self-weathering (Corten) steel transmission poles, burying pipelines and re-vegetating the disturbed area, and constructing new access roads in a manner similar to existing roads.

Off-Site Mitigation:

SME would agree to fund one or more of the following projects, as agreed to by the consulting parties, up to a reasonable cap on expenditures that is the subject of the MOA (Appendix K):

- The following proposals are designed to offset the negative visual impacts on the NHL by improving the viewshed of another Lewis and Clark related activity. SME will agree to fund one or more of these projects, as agreed to by the consulting parties, up to the total amount agreed upon by SME.
    - Assist in funding the acquisition of the property surrounding the staging area location and plant or allow the property to revert back to native vegetation. This will give visitors a sense of the conditions or setting present during the time of the portage.

  - Assist in funding the acquisition of available properties (directly across from the Center and the former Wilhelm house) across the Missouri River from the Lewis and Clark Interpretative Center to create and preserve in perpetuity a more natural unencumbered landscape for an increased visitor experience.
- Assist in funding (amount to be determined) the renovation of the Lewis and Clark Interpretative Center library and Lewis and Clark Trail Heritage Foundation Headquarters located in the Interpretative Center.
- Assist in and set up an annual contribution to assist in furthering and maintaining educational programs related to or part of the Interpretative Center's activities.
- Provide in-kind energy services to the L & C Interpretive Center if they can be accepted.

4.10 VISUAL RESOURCES

The extent of impacts to visual resources can be determined qualitatively by comparing the visual quality of the existing landscapes at the proposed Salem, Industrial Park, and transmission line interconnection routes with the expected visual quality of the areas upon completion of the Proposed Action. In Section 3-8 of this EIS, the Bureau of Land Management's Visual Resource Management (BLM VRM) system was used to conduct an abbreviated Visual Resource Inventory (VRI) of both alternative power plant sites. While a VRI was not performed on the potential transmission line corridors, these areas were described in words and illustrated with photos. In this section, VRM's Visual Resource Contrast Rating is used to determine the significance of aesthetic impacts at both sites and along the interconnection routes. The BLM VRM Visual Resource Contrast Rating classifications are shown in Table 4-17 below:

Table 4-17. BLM VRM Visual Resource Contrast Rating Classifications

Class	Dominance	Description
I	Not noticeable	The change would generally be overlooked.
II	Noticeable	Visually subordinate; change is subtle but noticed by most without being pointed out.
III	Distracting	Visually co-dominant; change competes strongly for attention and is equally conspicuous with other features.
IV	Dominant	Demands attention; change to landscape is the focus of attention and becomes the primary focus of the viewer.

4.10.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired power plant would be constructed at either the Salem or Industrial Park sites. In addition, no 230-kV electrical transmission line interconnections would be developed in the Great Falls area. Thus, there would be no direct impacts on visual resources from the No Action Alternative.

However, SME would need to purchase power from another generation source within the Western System Coordination Council (WSCC) to meet its projected baseload needs beginning in 2008. If generation and transmission capacity have to be expanded to meet a general growth in load to which SME would contribute, SME would be contributing indirectly and incrementally to the impacts on scenic resources that occur at other locations in the Rocky Mountain West and Pacific Northwest.

4.10.2 PROPOSED ACTION – HGS AT THE SALEM SITE

Figure 4-8. View of Salem site Looking South without HGS

Figure 4-9. View of Salem site Looking South with HGS power plant (proposed wind turbines not visible in this photo-simulation)

In Section 3.9.2, BLM's VRM Visual Resource Inventory classified the aesthetic resources at the Salem site as III. Class III visual resources are considered to have moderate scenic values. Figures 4-8 and 4-9 are rough photo-simulations of the Salem site before and after the HGS is placed on the site. From these, it is evident that the Visual Resource Contrast Rating would be Class IV – dominant (demands attention; change to landscape is the focus of attention and becomes the primary focus of the viewer). An additional adverse visual impact would occur from HGS-induced "light pollution" that would decrease the area's natural dark skies.

Thus, at the Salem site itself, the Proposed Action would entail a large visual change to a scenic setting of moderate value. Figure 4-10 depicts the viewshed of the HGS at the Salem site; that is, it shows those areas from which the 400-ft. high power plant stack and wind turbines would be visible. This figure shows that the power plant would be visible from most, but not all, of the Great Falls Portage National Historic Landmark. It would not be visible from the south and east banks of the Missouri River, nor from

stream and creek corridors and coulees. Figure 4-11 represents the HGS and wind turbines, to scale, as shown in their original location within the NHL and in the context of other major landscape features, such as Belt Creek, the Missouri River, and the Highwood Mountains. This figure was also used in the DEIS. In contrast, Figure 4-12 depicts the current modified location of the HGS and wind turbines, as a result of the Section 106 consultation process. The footprint of the power plant has been moved off the NHL in response to concerns expressed by a number of the consulting parties, but space constraints within the property preclude shifting the wind turbines to a location outside the NHL boundary.

Figure 4-13 is a photo-simulation of the HGS and wind turbines, once again to scale, from the staging area interpretive site approximately 1.25 miles north of the proposed plant. As is evident in the photo-simulation, the proposed facilities would be visible from the staging area; however, as Figure 4-14 shows, the existing view from this vantage point is not pristine. In particular, power poles are much in evidence. Finally, Figure 4-15 is the existing view north from the staging area toward the confluence of Belt Creek and the Missouri River; however, this existing view would remain the future view as well, even after implementation of the Proposed Action. In other words, the view north towards the Missouri – arguably a more important view than the view south across a rolling, cultivated plateau, because of the historic portage from the river commemorated by the NHL – would not be impinged upon by the Proposed Action. Likewise, at the northeastern end of the NHL (Figure 4-10), views of the Missouri River itself and of Belt Creek (Figures 4-16 and 4-17), from which the portage began, would remain largely unaffected.

The VRM methodology and criteria can also be applied to the two transmission interconnections that would also be constructed to carry electricity to the grid from the HGS. The electrical wires would be supported by monopoles, which are less visually obtrusive to most people than multiple-pole (usually two and three-pole structures with 230-kV lines) transmission towers. In the less developed eastern areas (closer to the Salem site), which the interconnections would traverse, scenic values are somewhat higher because the landscape is relatively open and less cluttered with existing transmission lines, communications towers, and other conspicuous structures. As the proposed interconnections continue west and approach the Great Falls-Broadview Tap Switchyard and the Great Falls Switchyard, respectively, they would converge with other existing transmission lines and enter an area in which the scenic value is already compromised by the presence of numerous, prominent structures, primarily existing power lines.

Thus, in the eastern portion of the proposed transmission routes, the impact would consist of a noticeable (Class II) change to a scenic setting of moderate value. In the westernmost portions of the proposed transmission routes, impacts would consist of a noticeable (Class II) change to a scenic setting of low value.

In deference to concerns expressed during ongoing Section 106 consultation by historic preservation parties about the potential impact of the HGS on the aesthetics of the Great Falls Portage National Historic Landmark, SME has offered to move the footprint of the power plant itself, as well as related structures, to a site about one-half mile south of its original proposed location. This action would help reduce, but not eliminate, visual resources impacts, because the HGS and its transmission lines would still be evident and the change would be dominant (in other words, Class IV) according to the Visual Resource Contrast Rating (Table 4-17).

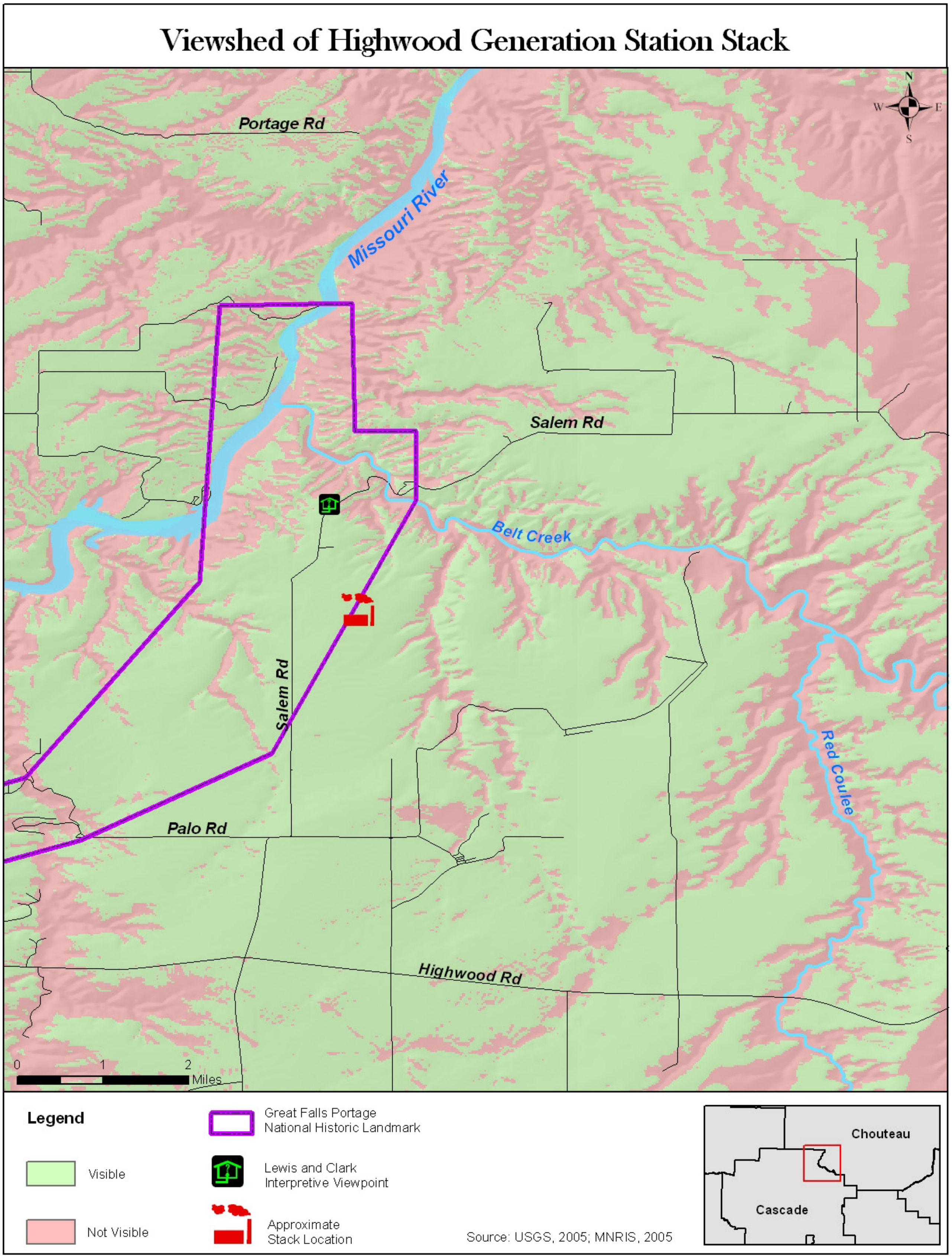


Figure 4-10. Viewshed of the HGS at the Salem Site

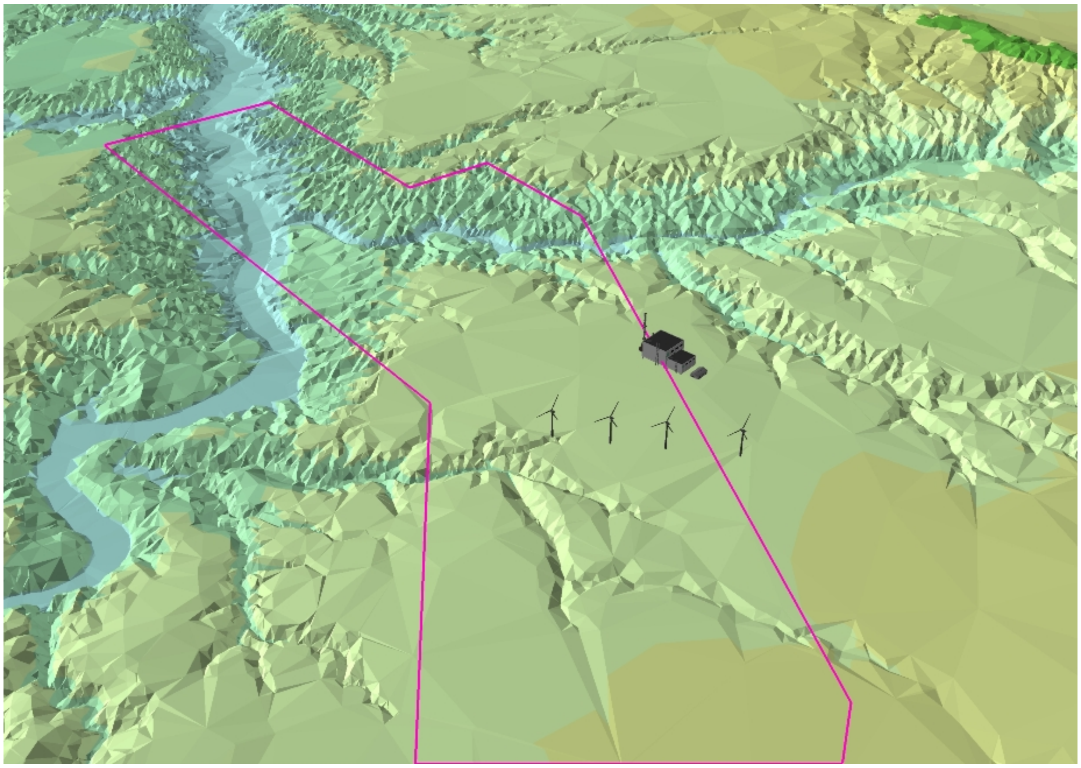


Figure 4-11. View Northeast toward Great Falls Portage NHL depicting original location of HGS and other Landscape Features to Scale, including Missouri River and Belt Creek

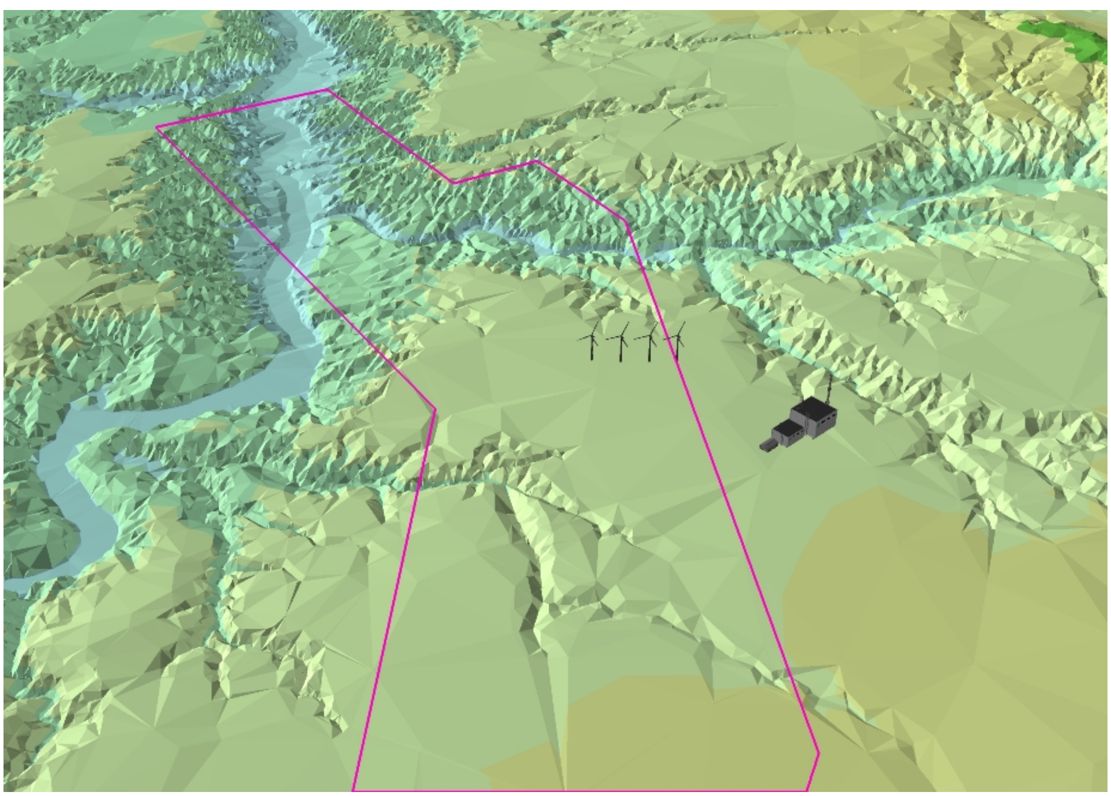


Figure 4-12. View Northeast toward Great Falls Portage NHL depicting current, modified location of HGS and other Features to Scale, including Missouri River, Belt Creek and Highwood Mtns.

Figure 4-13. Photo-Simulation of View Toward HGS and Wind Turbines from Great Falls Portage Staging Area – wind turbines are prominent but not dominant and stack of HGS is barely visible above horizon in right-center

Figure 4-14. December 2005 View from Great Falls Portage Staging Area looking south toward proposed HGS Site (Salem site)

Figure 4-15. View from Great Falls Portage Staging Area looking north toward Confluence of Missouri River and Belt Creek (December, 2005)

Figure 4-16. Confluence of Missouri River and Belt Creek (July, 2006), which Corps of Discovery ascended to begin portage, a view that would be unaffected by the HGS

Figure 4-17. View looking downstream along Missouri River from west bank (July, 2006), downstream of confluence with Belt Creek and still within Great Falls Portage NHL; this view would be unaffected by the HGS

4.10.3 Alternative Site – Industrial Park Site

In Section 3.9.2, BLM's VRM Visual Resource Inventory classified the aesthetic resources at the Salem site as IV. Class IV visual resources are rated as having low scenic values. While no photo-simulation has been made of the Industrial Park site, the Visual Resource Contrast Rating would likely be Class III – distracting (visually co-dominant; change competes strongly for attention and is equally conspicuous with other features). The generating station would be co-dominant rather than dominant because of the existing presence of the large IMC malt plant and other development nearby. Thus, at the alternative Industrial Park site, the proposed generating station would entail a moderate visual change to a scenic setting of low value.

The taller structures within the generating station, especially the 400-ft. high stack, would be visible from much of the Great Falls area (Figure 4-18), including from certain scenic overlooks above the Missouri River, such as along the River's Edge Trail and the Lewis and Clark Interpretive Center. The IMC malt facility is conspicuous at present, as are other structures in the vicinity to the north of the river. The generating station, if built and operated, would be visible to the left (west) of the IMC plant. It would become one of the two dominant manmade features north of the river.

The same methodology and criteria can be applied to the two transmission interconnections that would also be constructed to carry electricity to the grid from the Industrial Park site. As in the case of the Proposed Action, the electrical wires would be supported by monopoles. As described previously, in the vicinity of the Industrial Park site and Great Falls Switchyard, the proposed interconnections would be built in an area in which the scenic value is already compromised by the presence of numerous, prominent structures, especially existing power lines. Thus, impacts would consist of a noticeable (Class II) change to a scenic setting of low value.

Because the Industrial Park site is already bordered by development and large manmade structures, and zoned for more of the same, whereas the Salem site rests in a rural setting within a National Historic Landmark, siting the power plant at the Industrial Park would have less of an adverse impact on visual resources than at the Salem site.

4.10.4 Conclusion

There would be no direct impacts on visual resources from the No Action Alternative. However, by making power purchase, SME may contribute indirectly and incrementally to the impacts on scenic resources that occur at other locations in the Rocky Mountain West and Pacific Northwest.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Alter Scenic Quality" in Appendix J, the visual impacts of the Proposed Action would be of major magnitude, long-term duration, and small extent, and with a probable likelihood of occurring. Overall then, the rating for visual impacts from the Proposed Action would be significant and adverse. These impacts could be substantially lessened by the mitigation measures proposed – including moving the HGS location to just off the NHL, landscaping, and use of earth tone colors to reduce visual contrast – but they would remain significantly adverse.

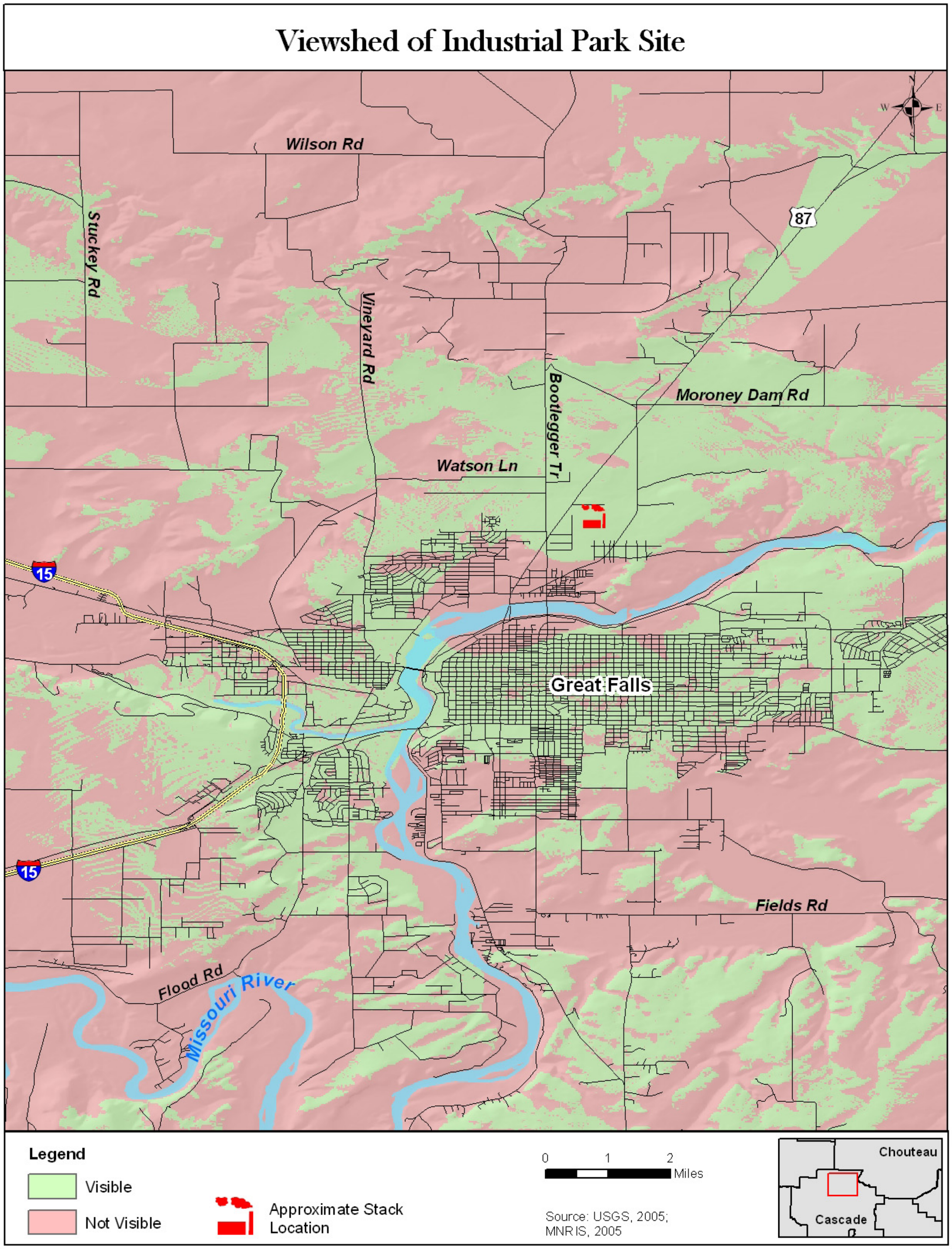


Figure 4-18. Viewshed of the SME Generating Plant at the Industrial Park Site*

- viewshed does not take into account the buildings in Great Falls, which would obstruct the views of the stack from town

The alternative Industrial Park site would have scenic impacts of moderate magnitude, long-term duration, and medium or localized extent, and have a probable likelihood of occurring. The overall rating for visual impacts from the alternative Industrial Park site would be adverse, and these impacts would be non-significant.

4.10.5 MITIGATION

Implementing mitigation measures to reduce visual resource impacts would be more important at the Salem site than the Industrial Park site, because the former has scenic resources of greater value. The following measures are examples of steps that can be taken to diminish visual impacts from constructing a generation station, appurtenant facilities, and transmission line interconnections at either site (BLM, no date-b):

1. Minimize the Number of Visible Structures.
2. Minimize Structure Contrast. Consider:
   a. using earth-tone paints and stains.
   b. using Corten steel (self-weathering).
   c. selecting paint finishes with low levels of reflectivity (i.e., flat or semi-gloss).
3. Redesign Structures that do not Blend/Fit. Consider:
   a. using rustic designs and native building materials.
   b. using natural appearing forms to complement landscape character (use special designs only as a last resort).
   c. relocating structure.
4. Minimize Impact of Utility Crossings of Roads.* Consider:
   a. making crossings at right angles.
   b. setting back structures at a maximum distance from the crossing.
   c. leaving vegetation along the roadside.
   d. minimizing viewing time.
   e. utilizing natural screening
5. Recognize the Value and Limitations of Color. Consider:
   a. that color (hue) is most effective within 1,000 feet (305 m). Beyond that point color becomes more difficult to distinguish and tone or value determines visibility and resulting visual contrast.
   b. that using color has limited effectiveness (in the background distance zone) in reducing visual impacts on structures that are silhouetted against the sky.
   c. painting structures somewhat darker than the adjacent landscape to compensate for the effects of shade and shadow.
   d. selecting color to blend with the land and not the sky.

* Most of this set is more applicable in areas covered with forest rather than the open range and prairie characteristic of the Great Falls area.

In addition, the selective planting of trees and shrubs in certain locations may help screen views of the facility. Finally, SME would endeavor to use the minimum exterior lighting necessary for safety purposes while trying to minimize adverse impacts to the natural dark skies of the area from diffuse, upward and outward facing lights that can cause “light pollution.”

4.11 TRANSPORTATION

Impacts from the proposed HGS at the Salem or Industrial Park sites on transportation and traffic could potentially occur during both the construction and operational phases of the Proposed Action. These impacts would be related to the transport of materials, supplies and equipment to the site during the construction phase, long-term transport of raw materials, primarily coal and limestone, during operation of the generating station, and the commutes of workers to and from the site both during construction and operation.

Both roads and railroad would be used to transport materials and equipment during construction. While the total number of truck or train trips needed to import materials to either the preferred or the alternative site over a period of 2-3 years is not known, in general the potential problems presented by construction traffic would not be the sheer volume, but slower speeds than normal traffic, road damage from heavy loads, and materials dropping onto roads, typically dirt being removed from construction sites in dump trucks, and road damage from heavy loads. Though somewhat lengthy in duration, these factors could still be considered localized, minor impacts at either site.

During construction, an average of 300 to 400 workers at any one time (with an estimated peak of 550) would be working in the area of the site and a number of these would be commuting to it. In addition, an undetermined percentage of workers would car-pool with fellow employees in their commute. For the purpose of this analysis, the worst case scenario of 550 vehicles each making two trips per day (or 1,100 ADT) is assumed. Around the country, the construction workday typically starts at 7 a.m., earlier than the average start time for most workers. This would have the effect of distributing total daily trips along routes traversed to construction sites across a wider number of hours and thus would reduce traffic flows, and therefore traffic congestion, during peak commuting times.

Over the long term, during the decades-long operation of the facility, approximately 50-60 workers would commute there on a daily basis. Two trainloads a week of coal would be delivered to the plant along the proposed rail spur from one of the BNSF railways in the Great Falls area.

Transportation of ash at the Salem site would be done on internal roadways in 50 ton trucks at about 5 truckloads per day. Transportation to an off-site disposal facility required at the Industrial Park site would require the use of road-worthy trucks. These trucks typically carry no more than 30 tons each. Ash transportation would require approximately 8 round trips per day to the selected disposal site.

4.11.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no power plant or wind turbines would be constructed at either the Salem or Industrial Park sites to meet SME's projected base load needs. Rather, SME would purchase electricity from existing generation sources in the Northern Rockies or Pacific Northwest, which could be a mix of large-scale hydro, natural gas, coal, nuclear, and to a smaller

extent, wind, solar, and other renewables. Under this alternative, during the immediate future, traffic volumes and road conditions in the vicinity of both the Salem and Industrial Park sites would be expected to remain much as they are at present. Over time, if current demographic and growth trends hold into the future, traffic volumes at the Industrial Park site would be expected to increase gradually.

The No Action Alternative would not contribute directly to transportation impacts at either the Salem or Industrial Park sites. However, by purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to ongoing transportation impacts at existing generating stations in the region. To the extent that expanding demand for electricity in the wider region drives construction of new generating facilities elsewhere, SME would thus be contributing indirectly to any transportation impacts associated with construction and operation of those facilities.

4.11.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.11.2.1 Construction

Under the Proposed Action, SME and its contractors would maintain existing aggregate roadways to be used for construction access. They would regrade and place additional aggregate on the existing roadways at the end of the construction period. A 1,800-ft (545 m) long paved access road into the site would be constructed and maintained from the existing Cascade County road, Salem Road. SME and its contractors would also construct and maintain an additional 6,600 feet (2,000 m) of paved internal roadways to facilitate plant construction and operations. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction. This internal road construction would take six months and would require 100 to 150 workers, including heavy equipment operators and mechanics, laborers, concrete finishers, surveyors and others. Construction equipment to be used would consist of bulldozers, backhoes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, compactors and others.

Whichever specific alignment it takes, the railroad spur connecting the BNSF tracks to the south would have to cross Secondary Highway 228. MDT requires the highest level of railroad crossing safety be provided in the development of all projects and strongly recommends a grade separated crossing and specifically that S-228 be designed to go over the top of the BNSF spur. This route is used by overheight loads because of height restricted railroad overpasses on the other routes into Belt. Therefore, a grade separated bridge for the S-228 crossing over the BNRR spur is being considered as a mitigation to the Salem site. Following federal and state Right of Way acquisition regulations, SME would be responsible for acquiring the necessary Right of Way in the name of MDT.

From Great Falls, plant access would be from southbound U.S. Route 87/89 to eastbound S-228 to northbound Salem Road, thence to the site. Under this alternative, over the short term, during the 2-3 year busiest construction period, the combined ADT of Salem Road would increase considerably, jumping from 36 to a peak of about 1,340. Most of the traffic would occur early in the morning and mid- to late afternoon when workers are arriving at and departing the

construction site. At other times – most of the morning, mid-day, evening, and nighttime – traffic would be relatively minimal, except for occasional truck traffic. Thus, during both the morning and afternoon commutes, a peak of approximately 550 vehicles per hour could be entering and exiting the construction site for a short duration. According to the *Highway Capacity Manual* of the Transportation Research Board of the National Research Council, this traffic volume would represent an LOS of B (see Table 3-26 in Section 3.9.1 for a description of LOS B). That is, there would be "stable flow, but presence of the users in [the] traffic stream becomes noticeable." Both commuters to the project and existing residents who venture out during busiest traffic periods could potentially face generally minor delays and inconvenience. The greatly increased flow of traffic on the aggregate Salem Road would create plumes of fugitive dust, which could potentially constitute a minor annoyance or inconvenience for the few nearby residents and local motorists.

On S-228, the ADT would go from 549 to potential maximum of approximately 1850. Unlike the Salem Road, SR-228 is paved, so that even though both are one-lane each direction, it can accommodate greater traffic flow. Traffic impacts on the subject segment of S-228 would be comparable to those along the Salem Road: LOS should not degrade to below B or C even during early morning and mid-afternoon commute times.

Concerns over congestion and related safety issues arise at two intersections along the anticipated commuting route to the Salem site from Great Falls: 1) the intersection of US 87/89 and S-228 (eastbound US 87/89 traffic turning left onto SR-228 in the morning and westbound traffic turning right onto US 87/89 from S-228 in the afternoon) and, 2) the intersection of 10th Ave South and 57th Street. Similar traffic volumes would be expected at both intersections. A short-term increase in traffic of approximately 550 vehicles per hour (estimated maximum) on the operations of these intersections during HGS construction for the morning and afternoon commuting times could result in an LOS of D, which would be a short-term significant, adverse impact on traffic congestion.

Secondary Highway 228 was constructed in 1957 with a 24 to 26 foot-wide typical section and has vertical and horizontal alignments that do not meet today's Safety and Design standards. Unless it is upgraded, the increased traffic and weight of the vehicles that would be using this road during HGS construction is likely to result in damage to this roadway, including cracks, potholes, and/or crumbling edges, and an increase in risks to the safety of motorists.

Prior to commencing construction of the HGS, and following MDT's procedures, SME would prepare a traffic mitigation plan that would state specifically how S-228 would accommodate the increased traffic and load from HGS construction. The plan would indicate whether improvements would be made to S-228, or if another means would be adopted, such as placing load and/or speed limits on S-228 until the Salem Road intersection. Load and/or speed limits would impact loads to the HGS and would also impact local farmers and other agricultural interests who use S-228 for access. The traffic mitigation plan would address the current road condition and economic impact of reduced loads and/or lower speeds. It would determine whether vertical and horizontal safety concerns need to be evaluated and mitigated.

As stated above, the intersection of Salem Road and S-228 would have a high volume of turning traffic. During construction of the HGS, the entering and exiting vehicles would include many trucks, with slower speeds and longer acceleration distances. Under MDT supervision, SME would construct a Left Turn Lane, a Right Turn Lane and an acceleration lane before HGS construction begins. Details on how these improvements would be completed and funded would be addressed in the traffic mitigation plan.

Construction of the rail spur line to the Salem site from the existing BNSF rail line approximately 6.2 miles south of the project site near Fife would have a minor, short-term impact on existing rail and road facilities. At the intersection with SR-228, the State of Montana would require that the railroad be grade-separated from the existing highway. To do so would require construction of a new roadway bridge, and reconstruction of approximately 5000 feet (almost a mile) of highway pavement. Roadway construction and maintenance as required, providing site access is controlled in part by the route selected for the railroad spur. The minimum width of the Right of Way for the construction and operation of the rail spur is 160 feet (50 m) on level terrain and could extend to 400 feet (123 m) depending on the depth of cut or fill in the terrain.

Development and operation of this overpass would be a substantial project in its own right, requiring close cooperation on planning, construction, operation and maintenance between SME, MDT, BNSF, and possibly other county, state and federal agencies. Provisions would have to be made for detouring S-228 traffic around the construction site with a minimum of delay and disruption over a period of several months. Localized, short-term impacts would be expected on soils and geology, landform, storm runoff, air quality (fugitive dust and tailpipe emissions from operating heavy equipment), flora and fauna, visual resources, noise, and human health and safety. These impacts would be managed under MDT requirements, and thus would likely be negligible to minor in magnitude. Impacts on all resources from operation of the grade separated bridge crossing would be mostly negligible.

4.11.2.2 Operation

During the long-term operation of the HGS, traffic impacts from 50-60 commuting workers would be negligible to minimal. The main bulk material – coal – would be transported to the site using rail, so that impacts on road systems would be non-existent to negligible.

When tall structures like the stack or stacks associated with a coal-burning power plant, or the proposed wind turbines, are located in close proximity to an airport and might interfere with aviation, the FAA would require a study of the project's impact on navigable airspace. During the project proposal stage, the FAA requires the filing of FAA Form 7460-1, Notice of Proposed Construction or Alteration with the Air Traffic Division to the FAA's Central Regional Office. Before actual construction occurs, the FAA requires the filing of FAA form 7460-2, Notice of Actual Construction or Alteration to the regional office (FAA, 2004). However, because the HGS at the Salem site would be located approximately 12-13 miles from the Great Falls International Airport, this would be unnecessary. Both the stack and the wind turbines may require the placement of lights for aviation safety.

The requirements for this notice may be found in Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace. This regulation is contained under Subchapter E, Airspace of Title 14 of the Code of Federal Regulations. If any part of the projects exceeds notification criteria under FAR Part 77, notice should be filed at least 30 days prior to the proposed construction date.

Potential impacts of the Proposed Action on rail transport could hypothetically include congestion and the concomitant need for expanded capacity to accommodate delivery of coal by rail to the HGS. On behalf of SME, Stanley Consultants inquired with BNSF Railway, owner/operator of the nearest tracks to the Salem site. During these conversations, BNSF commented positively about the proposed route and was not concerned that the HGS could cause congestion on existing railways that it would use (Walters, 2006).

The new delivery route would transport coal northwest from the Spring Creek – Decker area to the Great Falls area. BNSF stated that current congestion is south and east from the Powder River Basin. Therefore, the approximate two train loads of coal per week from the Spring Creek – Decker area to HGS would not contribute to current or future projected congestion and would actually help BNSF (i.e., revenues would grow and no infrastructure investments would be needed for this delivery).

4.11.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.11.3.1 Construction

If the alternative site were to be used, SME and its contractors would maintain existing aggregate roadways to be used for construction access across the Industrial Park. They would regrade and place additional aggregate on these existing roadways at the end of the construction period. SME and its contractors would also construct and maintain all paved internal roadways to facilitate plant construction and operations. These on-site, paved roads would be aggregate-based during construction and would be paved upon completion of heavy construction. As with the Salem site, this internal road construction would take approximately six months and would require 100 to 150 workers, including heavy equipment operators and mechanics, laborers, concrete finishers, surveyors and others. Construction equipment would consist of bulldozers, backhoes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, compactors and others.

From Great Falls, plant access would be from northbound U.S. Route 87. (MDT plans to widen US 87 north of Great Falls in the next few years.) Under this alternative, over the short term, during the several year construction period, the combined ADT of the US 87 would increase notably, going from 7,718 to a peak of just over 9,000. Most of the project-related traffic would occur early in the morning and mid- to late afternoon when workers are arriving at and departing the construction site, largely avoiding typical morning and evening rush hours for Great Falls. At other times – most of the morning, mid-day, evening, and nighttime – construction-related traffic would be relatively minimal, except for occasional truck traffic. Thus, during both the morning and afternoon commutes, a peak of approximately 550 vehicles per hour could be entering and exiting the construction site. The volume of traffic on U.S. 87 between the off-peak

hours of 6 and 7 a.m. and 3 and 5 p.m. is unknown (Combs, 2006), but assuming it is five percent of the ADT for each of these hourly periods, then about 400 vehicles in both directions would be transiting this segment during each of these hours without the power plant construction traffic. Adding 550 vehicles of construction-related traffic would represent a total of approximately 950 vehicles per hour.

According to the Highway Capacity Manual of the Transportation Research Board of the National Research Council, 1,050 vehicles per hour would represent an LOS of between B and C (see Table 3-23 in Section 3.9.1 for a description of LOS B). That is, traffic movement would be somewhere between “stable flow, but presence of the users in [the] traffic stream becomes noticeable” (LOS B) and, “stable flow, but operation of single users becomes affected by interactions with others in traffic stream” (LOS C). Both commuters to the project and existing residents who venture out during busiest traffic periods could potentially face generally minor delays and inconvenience.

Traffic delays at the intersection of US 87 and the access road to the Industrial Park construction site could occur during morning and afternoon rush hours as a result of adding 550 vehicles per hour to this intersection. This would constitute a significant but short-term, localized impact on traffic. Improvements at this intersection might prove necessary to prevent motorist safety from being compromised.

For this alternative, SME would likely extend the existing rail spur to the IMC malt plant to accommodate the arrangement at the Industrial Park site. No specific route for the possible construction of a rail spur extension to the Industrial Park site from the existing spur to the IMC plant has been identified. However, based on what is known of transportation infrastructure in the surrounding area and the nature of such construction, it would likely have a minor, short-term impact on existing rail and road facilities.

4.11.3.2 Operation

During the long-term operation of the HGS, traffic impacts from 50-60 commuting workers along the U.S. 87 corridor would be negligible to minimal. Up to eight truckloads of ash may have to be hauled on the highway daily, depending on the disposal site selected.

The main bulk material – coal – would be transported to the site using rail, so that impacts on road systems would be non-existent to negligible. There would be some potential for an increase in rail traffic in Great Falls causing minor traffic delays at street crossings, but two trains per week would constitute a minor impact at most. Still, whenever a long unit car coal train used the Malting Barley Railroad access spur, this would result in lengthy delays on the NE Bypass near 38th street because of long trains. Currently most of the trains passing through Great Falls move at a slow speed and several crossings would be impacted simultaneously because of the length and slow speed of HGS trains. This would seriously impact public safety when emergency vehicles are held up.

As stated above in Section 4.11.2.2, when tall structures like the stack or stacks associated with a coal-burning power plant are located in close proximity to an airport, the FAA would require a

study of the project's impact on navigable airspace. However, because the Industrial Park site is located approximately four miles from the Great Falls International Airport, this would probably not be necessary. The stack would likely require aviation safety lights, however.

Potential impacts of the alternative site on rail transport would essentially be the same as with the Proposed Action. These could hypothetically include congestion and the concomitant need for expanded capacity to accommodate delivery of coal by rail to the HGS. However, as noted in the case of the Proposed Action, Stanley Consultants' inquiry with BNSF indicated that the railroad owner/operator was not concerned that this project could cause congestion on existing rail routes that it would use (Walters, 2006).

4.11.4 CONCLUSION

The No Action Alternative would not contribute directly to transportation impacts at either the Salem or Industrial Park sites. However, by purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to ongoing transportation impacts at existing generating stations in the region. To the extent that expanding demand for electricity in the wider region drives construction of new generating facilities elsewhere, SME would thus be contributing indirectly to any transportation impacts associated with construction and operation of those facilities.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for "Traffic Congestion" in Appendix J, construction-related impacts on traffic from the Proposed Action would be of moderate magnitude, medium-term duration, and small extent, and have a probable likelihood of occurring. The overall rating for impacts on traffic congestion from the Proposed Action <u>during the construction phase</u> would be <u>adverse and significant</u>. There would be no appreciable construction-related impacts on air transportation in the Great Falls area from construction at the Salem site. There would be minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect; coordination between SME and BNSF would minimize any disruption of service or transport. <u>In addition, there would be minor short-term impacts on traffic and on natural resources from construction of an overpass at the crossing of the rail spur and S-228.</u> Over the long term, during operation of the proposed HGS, <u>its</u> impacts on road, rail and air transportation would be generally negligible.

Construction-related impacts of the alternate site – the Industrial Park site – would be comparable to those of the Proposed Action. Temporary construction-related impacts on roads, traffic and rail would be greater than long-term operational impacts, and they would be adverse, and significant<u>, though only over the short-term, during construction</u>.

4.11.5 MITIGATION

Mitigation would consist of standard measures used to minimize traffic congestion and damage to public roads during large construction projects. This would include appropriate signage to alert motorists approaching turnoffs to the construction site from both directions at distances of approximately 200 to 400 yards. If temporary detours and/or street closures would be necessary at any location, road crews and signs would safely and efficiently redirect oncoming traffic to the

detour. Any material, such as dirt, falling from trucks would be removed promptly so as not to present a traffic hazard. Any damage to road surfaces from heavy equipment movement would also be repaired promptly.

As discussed above, for the Salem site, SME would cooperate with MDT, BNSF Railway, and county transportation officials with regard to planning and construction of a separated grade crossing of S-228 and the proposed rail spur to the HGS. Additionally, in consultation with MDT, SME would prepare a traffic mitigation plan prior to construction. This plan would address specific measures for improvements or other actions to reduce congestion and protect motorists' safety at several key intersections along the commuting route between Great Falls and the Salem site – namely US 87/98 and S-228, S-228 and Salem Road, and 10th Avenue South and 57th Street.

4.12 FARMLAND AND LAND USE

4.12.1 NO ACTION ALTERNATIVE

The No Action Alternative would not adversely affect or alter existing land uses at or near the Salem site or the Industrial Park site. The Salem site would continue to be maintained in agricultural production and the Industrial Park site would continue to be open space.

Insofar as SME would need to meet energy supply needs in the service area by purchasing power from existing generation wholesale suppliers located elsewhere, SME could potentially be contributing indirectly to ongoing farmland and land use impacts where other suppliers have developed highly valued farmland and converted it to industrial uses at different generating stations in the region or at potentially new generating stations located outside of the region.

4.12.2 PROPOSED ACTION – HGS AT THE SALEM SITE

Impacts to farmland and land use can either be direct or indirect. Direct impacts include the actual conversion or alteration of land use in a specific area caused by physical changes in the land, and indirect impacts include those that can change or alter land uses on adjoining properties or in the region, and are caused by social, economical, or ecological changes associated with the power plant. Direct impacts, the actual physical conversion or alteration of land in order to make the plant operation-ready, would be captured under the construction subsection. Indirect impacts, those caused by the influence the power plant could have on adjacent area land uses, would be captured under the operation subsection.

4.12.2.1 Construction

The area of land that would be directly impacted and/or altered by the construction of the power plant at the Salem site includes the footprint of the power plant, and the roadways, rail lines, and utility corridor zones required to make the plant operation-ready. Specifically, the power plant would require the construction of the following elements:

- The power plant and associated facilities on a total footprint of approximately 545 acres (221 ha);
- A 1,800-foot long paved access road from the existing Cascade County road (Salem Road) into the site;
- A 6.3-mile railroad spur, extending south from the plant and tying into an existing main line track that is located three miles south of the city of Great Falls;
- Two short segments of electrical transmission line with new 100-foot rights-of-way; the first line would be approximately 4.1 miles long and would extend from the plant site to a new switchyard site proposed for a location south and west of the Salem site, while the second line would be approximately 9.21 miles in length and would extend south and west from the plant site, across the Missouri River north and east of Cochrane Dam;
- A raw water supply system which would include a collector well extending into the Morony Reservoir and associated water intake pipelines extending approximately two miles to the plant site;
- 55,000 feet (16,800 m) feet of fresh potable water supply and waste water pipelines from the power plant to the City of Great Falls water and sewer lines; and
- The installation of four nearly 400-ft (121-m) tall wind turbines that would be used to supplement power from the generating station.

The footprint of the power plant and all lands adjacent where construction would take place are currently agricultural lands. No homesteads would be moved as a result of activities, and the only structure that would be moved would be Secondary Highway 228, which would need to be raised in order to the accommodate the new railroad spur. The conversion of agricultural lands in and of themselves, to an industrial plant with supporting facilities and infrastructure, would be considered only a minor impact, though the impact would be permanent. Because the agricultural land that would be converted is not protected farmland and does not have a significant productivity rating, the conversion of this land in context to the amount and quality of farmland in other areas of Cascade County is not considered significant.

SME would negotiate the purchase of easements with other property owners in the vicinity whose land may be required for transmission line and/or pipeline rights-of-way. Although the easements would be likely held in perpetuity, various activities would be allowed to continue in the electrical transmission right-of ways. The right-of-ways would be approximately 100 feet (30 m) across in total width, with the poles being centered at around the 50-foot (15-m) mark. Activities that would probably be able to continue in the rights-of-way include agricultural activities, grazing, and most types of recreation. The location and presence of the right-of ways is not anticipated to affect land use in the area.

In the event that an easement or sale in fee simple cannot be obtained for a specific right-of-way, the land may be taken by eminent domain. This would involve condemning the piece of property for the “public use”. In condemning the property, the landowner would be fairly compensated for the land, and the land would become publicly owned. Any activities determined to be compatible with the presence of the transmission lines can continue in condemned rights-of-way, including most types of recreation.

Construction activities could potentially cause some moderate to major indirect nuisance impacts to adjacent land owners, especially to the residents of the home located northwest of the site near where the raw water intake pipeline would be installed. Impacts such as noise, dust, and increased traffic would be moderate to major, short-term, small extent, and probable. While these nuisance impacts would affect the quality of life for nearby residents, they would not have an effect on the actual uses of adjacent land. Insulation and other noise reducing equipment, dust abatement, and restrictions on the timing of construction activities, whenever possible, would help reduce the potential construction associated impacts to area residents.

Minimal impacts would be anticipated to the farmstead located northwest of the facility, where the railroad spur line and fresh- and waste-water pipelines would be installed, as it is currently unoccupied. However, if the farmstead owners were to establish residency in the home, they could potentially be exposed to the same construction-associated impacts as described above. Impacts to residents and area visitors from facility operations, including increased traffic, railcars, noise, and light, are all discussed in their respective impact topics. The effect that all of these impacts may have on the changes in land use are discussed below, in the operations section.

If the Salem site were to remain unincorporated county land, the county could issue a special use permit for the plant in order to allow it to operate on agriculturally zoned land. In order to issue the permit, the county would hold a pre-application meeting, generate a staff report where it identifies potentially contentious issues, and then hold public hearings on the project. At the end of the hearing, a final decision would be made. If the decision were made to allow the project to operate on agriculturally zoned lands, and the permit would be issued, potentially with conditions. These conditions could involve requirements for such mitigations as additional landscape buffers, road maintenance/upgrades, noise abatement, and security fencing (Clifton, 2006). Even if the site remained as county land, it would still be eligible to hook up to the City of Great Falls municipal water and sewer systems with the approval of the city.

If the Salem site were to become annexed into the city, in addition to annexing the Salem site, a corridor extending out to the site from current city land would have to be annexed. This corridor would include the location of city's utility lines, which would be installed from the west side of Malmstrom Air Force Base, where the city utility lines currently end, out to the site (Walters, 2006).

The preferred method of annexation is to annex the land in question prior to the application of any city/county permits, so that the responsible local governing body has jurisdiction over the site's permits. Thus, if the Salem site were to be incorporated, it would apply for annexation prior to the commencement of construction activities. The steps for annexing county land into the city are outlined in the box below and contained at the Great Falls City Planning Department website at: http://www.ci.great-falls.mt.us/people_offices/planning/procanexsub.htm .

Once annexed into the city, the city would establish zoning on the land. Zoning for a coal burning power plant would most likely be category I-2: heavy industry, which permits the operation of major electrical installations (Walters, 2006).

GENERAL PROCEDURES FOR LAND ANNEXATION

1. Potential applicant discusses feasibility of annexation, annexation requirements, City zoning, general procedures and time frame with Planning staff followed by a pre-application conference, if appropriate.
2. Applicant is encouraged to visit with surrounding property owners and representatives of the neighborhood council in which the annexation is located to present the project and solicit input.
3. Applicant submits formal annexation and zoning petitions, initial fees and preliminary site plans and engineering documents to Planning Office.
4. Planning staff transmits necessary materials and information to review officials.
5. "Zoning Notice of Public Hearing before Planning Board" is published in Tribune at least 15 days prior to hearing.
6. Planning staff mails copy of public hearing notice to all property owners within 150 feet radius of area requested to be annexed and zoned.
7. Planning staff works with applicant and review officials to develop final annexation requirements and prepares report and recommendation to Planning Board.
8. Planning staff posts public hearing notice sign on property requested to be annexed and zoned.
9. Planning Board holds public hearing and arrives at a recommendation.
10. Applicant submits:
    - Final engineering drawings;
    - Agreement containing terms and conditions for annexation;
    - Payment of applicable fees;
    - Financial guarantee;
    - Any other documents required as a condition of approval.
11. Planning staff provides final documents to appropriate officials for review and approval.
12. Planning staff prepares a resolution of intent to annex and a zoning ordinance, and submits them to City Commission.
13. City Commission adopts resolution of intent to annex and accepts zoning ordinance on first reading and sets date for public hearing.
14. Notice of public hearing is published in *Tribune* for two successive weeks with first publication at least 20 days prior to hearing.
15. Planning staff submits Board recommendation, annexation agreement, and related documents to City Commission.
16. City Commission conducts public hearing for final annexation resolution and zoning ordinance, acting on each separately, together with the annexation agreement and any related documents.

Source: Great Falls City Planning Department

It is possible that objections could be raised to the annexation of the Salem site and its utility corridors, especially from the county. A main concern is anticipated to be the potential changes in land use surrounding the plant area, due to the city's infrastructure extending six miles east of the city, and the heavy industry zoning that would be established at the plant. These impacts are all associated, indirect impacts caused by the influence of the power plant and will be discussed in the operation subsection below.

On November 29, 2006, Cascade County Commissioners voted 2-1 to rezone the 840 acres SME proposes to purchase as heavy industrial. On December 23, 2006 a group of plaintiffs including nearby residents and farmers and the Montana Environmental Information Center filed a lawsuit in Montana District Court challenging the rezoning. Plaintiffs alleged that County officials violated state law and county policies when they approved the rezoning of this land (AP, 2006b).

4.12.2.2 Operation

The operation of the power plant would cause no additional direct impacts to land use or farmland. No additional amounts of land would be developed for the plant once the construction phase is completed. However, the presence, influence, and impacts of the power plant and its associated support facilities could all indirectly influence land uses on adjoining or nearby properties in the vicinity of the site.

The power plant at the Salem site would be an industrial facility situated amidst agricultural lands. The siting of the plant, and the reliable infrastructure and possible cogeneration energy that would be available in this area once the plant is operational, could well attract additional business to the surrounding area, particularly those industries requiring high energy inputs or power plant byproducts as inputs. The possibility of cogeneration, using waste heat from the power plant, is attractive to certain kinds of industries. Ethanol refineries, concrete manufacturers, and wallboard companies are examples of firms that would benefit from being located immediately adjacent to a power plant.

Additionally, impacts associated with air quality, noise, visual resources, and traffic would all potentially decrease the quality of life for area residents downwind of the facility or adjacent to transportation routes. Though these impacts are all discussed in their respective sections, they could potentially cumulatively affect one particular area and be perceived as adverse enough to residents that they would choose to relocate. While the relocation of any residents would not cause a land use change in of itself, land put up for sale in the area may be attractive to an industrial developer. The addition of any industry would perpetuate the impacts of decreasing the quality of life for residents of this rural agricultural area, and over time this cycle could continue and the predominant land use in the area could change from being primarily farmland to being primarily industrial land.

While increased industrialization of the area in the vicinity of the Salem site is a possibility, it is a possibility fraught with many uncertainties. It is also a trend that could either be perpetuated or stopped by both the county and city Planning Boards. Regardless of whether or not the Salem site stays as county land or becomes annexed into the city, all adjacent and surrounding lands would remain zoned for agriculture. Any new industry would have to obtain either a land use permit or a zoning change for the area of interest, which would involve public hearings and planning board approval. Notwithstanding that, the development of the Salem site in and of itself may reduce the property values of nearby rural, agricultural land, with repercussions on land assessments and property taxes. If they occur, these impacts would be very localized and the actual land uses of surrounding properties are not anticipated to be significantly affected.

4.12.3 Alternative Site – Industrial Park Site

4.12.3.1 Construction

The area of land that would be directly impacted and/or altered by the construction of the power plant at the Industrial Park site includes the footprint of the power plant, and the roadways, rail

lines, and utility corridor zones required to make the plant operation-ready. Specifically, the power plant would require the construction of the following elements:

- The power plant and associated facilities on a total footprint of roughly 300 acres (121 ha);
- A 5-mile railroad spur, beginning north of the Missouri River and extending west to the plant site;
- At least one short segment of electrical transmission line with new 100-foot rights-of-way, extending from the site one mile east to the Great Falls switchyard site;
- A raw water supply system which would include a collector well extending into the Morony Reservoir and associated water intake pipelines extending approximately 17 miles to the plant site; and
- Fresh potable water supply and waste water pipelines of undetermined length from the power plant to the City of Great Falls water and sewer lines.

The footprint of the power plant and many of the lands adjacent to the areas where construction would take place are currently agricultural or open space lands. Some adjacent areas are industrial, and to the southwest and southeast of the site there are low-density residential lands. No homesteads or structures would be moved as a result of construction activities. The conversion of agricultural lands in of themselves, to an industrial plant with supporting facilities and infrastructure, would be considered a minor impact. Land that would be developed includes a minor amount of land that is classified as agricultural land of statewide importance, an additional minor amount of land with no designation, and a majority of land that is protected as prime farmland only if it is irrigated cropland. Much of this land is generally of good quality for agricultural uses according to the land evaluation productivity rating. However, the development and conversion of this land is considered not significant because the area is not actively irrigated or cultivated, is located next to several industrial developments, and is a very small amount of farmland in context with other areas of Cascade County.

Most activities in the area would be allowed to continue in the electrical transmission right-of ways, as described under the Salem site. Construction activities could potentially cause some moderate indirect nuisance impacts to adjacent land owners. However, these nuisance impacts would not have an effect on the actual uses of adjacent land. Because the site would be situated next to another major industrial facility, the IMC plant, these impacts would be considered an adverse incremental impact to the quality of life for residents, but one that is not significant.

The Industrial Park site is currently located on unincorporated county land, but there is an almost certain probability that it would be annexed into the city if the plant were to be constructed on the site (Clifton, 2006). The IMC plant, located approximately one half mile southwest of the site, is located on annexed, or incorporated, city land. The city municipal sewer and water lines currently run to the IMC plant.

The preferred method of annexation is to annex the land in question prior to the application of any city/county permits, so that the responsible local governing body has jurisdiction of the site's permits. The Industrial Park site would follow the same steps for applying for annexation into the city as outlined for the Salem site. Once annexed into the city, the city would establish

zoning on the land. The zoning for the coal burning power plant would most likely be category I-2: heavy industry, which permits the operation of major electrical installations (Walters, 2006).

It is anticipated that there may be fewer objections raised to the annexation of the Industrial Park site than to the Salem site. The Industrial Park site is located closer to the current city boundaries (about a half-mile compared to six miles for the Salem site), and adjacent land is already industrialized. However, because of the proximity of the Industrial Park site to the city and to a greater amount of residential and developed areas, there exists a greater potential for user conflicts and impacts from the plant, as discussed in the operation subsection below.

4.12.3.2 Operation

The operation of the power plant would cause no additional direct impacts to land use or farmland. No additional amounts of land would be developed for the plant once the construction phase is completed. However, the presence, influence, and impacts of the power plant and its associated support facilities could all indirectly influence land uses on adjoining or nearby properties in the vicinity of the site.

The greater proximity of residential areas and other businesses to the Industrial Park site could potentially create more conflicts than at the Salem site. And while there may be more competing interests, and many more receptors for potential impacts from plant operations, the actual influence that a power plant could exert on nearby land development would be less at the Industrial Park site than at the Salem site. Because there is much more land in the vicinity of the Industrial Park site that has been developed, additional industrial growth would be under greater public scrutiny, pressures, and land constraints.

The development of the Industrial Park site in and of itself may reduce the property values of nearby agricultural or residential land, with repercussions on land assessments and property taxes. These impacts will be localized and the actual land uses of surrounding properties are not anticipated to be significantly affected.

4.12.4 CONCLUSION

The No Action Alternative would not adversely affect or alter existing land uses at or near the Salem site or the Industrial Park site. The Salem site would continue to be maintained in agricultural production and the Industrial Site would continue to be open space. Insofar as SME would need to meet energy supply needs in the service area by purchasing power from existing generation wholesale suppliers located elsewhere, SME could potentially be contributing indirectly to ongoing farmland and land use impacts where other suppliers have developed highly valued farmland and converted it to industrial uses at different generating stations in the region or at potentially new generating stations located outside of the region.

The construction of a power plant at either the Salem or the Industrial Park site would involve the direct conversion of agricultural lands to an industrialized facility with supporting infrastructure. No homesteads or residences would be moved under either alternative. In the context of the amount of quality farmland in other areas of Cascade County, the actual

conversion, or development, of the land required for the plant, impacts would be of minor magnitude, long-term duration, medium extent, and have a probable likelihood of occurring. The overall rating for impacts on land use from the construction phase of the power plant would be adverse, and while impacts would most likely be non-significant; there is some potential for impacts to become significant at both sites.

The operation of the power plant at the Salem site would cause no additional direct impacts to land use or farmland. However, the influence and impacts of the power plant and its associated support facilities could indirectly influence land uses on adjoining or nearby properties in the vicinity of the site. The impacts associated with operating the plant could potentially cumulatively affect one particular area and be perceived as adverse enough to residents that they would choose to relocate. Over time this cycle could continue and the predominant land use in the area could change from being primarily farmland to being primarily industrial land.

Additionally, the development of the Salem site in and of itself may reduce the property values of nearby rural, agricultural land, with repercussions on land assessments and property taxes. These impacts would be localized and the actual land uses of surrounding properties are not anticipated to be significantly affected. The impacts on land use from the operation of a power plant at Salem would be of moderate magnitude, long-term duration, and medium extent, and have a possible likelihood of occurring. Overall, the rating for impacts at the Salem site would be adverse, and while impacts would most likely be non-significant, there is some potential for impacts to become significant.

Similar to the Salem site, the operation of the power plant at the Industrial Park site would cause no additional direct impacts to land use or farmland. Indirectly, however, the greater proximity of residential areas and other businesses to the Industrial Park site could potentially create more land use conflicts than at the Salem site. These conflicts would place greater public scrutiny, pressures, and land constraints on development at the Industrial site, reducing the influence or impact of the power plant on nearby properties when compared to the Salem site. That said, the development of the Industrial Park site in and of itself may reduce the property values of nearby agricultural or residential land, with repercussions on land assessments and property taxes. The impacts on land use from the operation of a power plant at the Industrial Park site would be of minor magnitude, long-term duration, medium extent, and have a possible likelihood of occurring. Overall, the rating for impacts at the Industrial Park site would also be adverse and non-significant; however, with this alternative as with the Proposed Action, there is some potential for impacts to become significant.

4.12.5 MITIGATION

While there are no significant impacts from the action alternatives on the actual physical land development at the sites, there are somewhat significant adverse impacts on land use from the influence and impacts of the power plant. Measures to control the impact of the plant on surrounding land uses include ensuring that adjacent lands remain zoned as agricultural lands. Any new industry interested in the area would then be required to individually obtain either a land use permit or a zoning change, in addition to all other applicable permits.

Additionally, mitigation measures taken to minimize construction and operation impacts to other resource areas (e.g. reduction in noise, visibility, and air quality impacts) would also directly lessen the impacts that could potentially decrease the quality of life for area residents to the point that residents would choose to relocate. Stemming residential relocations as much as possible by the extensive use of other mitigation measures would help prevent land use changes and conversions.

4.13 WASTE MANAGEMENT

4.13.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no site development would occur, no waste would be generated from the sites, and no waste management would be needed at the sites. However, by purchasing power from generation sources elsewhere, SME would be contributing indirectly to ongoing waste management needs at different generating stations in the region or at potentially new generating stations located outside of the region.

4.13.2 PROPOSED ACTION – HGS AT THE SALEM SITE

The Montana DEQ's Waste and Underground Tank Management Bureau (WUTMB) regulates solid waste facilities and hazardous waste generators in Montana. WUTMB responsibilities include conducting inspections at businesses that generate hazardous waste and used oil, and at solid waste management facilities, to ensure compliance with management standards. Additionally, the WUTMB provides technical assistance for those businesses and waste management facilities to promote and maintain federal and state compliance. Tools to achieve compliance include technical reviews, licensing, certifications, and compliance monitoring programs.

Electrical generating facilities that dispose of solid wastes on-site are specifically exempted from the requirements of the Montana Solid Waste Management Act in § 75-10-214(1)(b), MCA. This was done because the facilities were formerly regulated under the Major Facilities Siting Act and the exemption was granted to prevent double regulation of a single waste management unit. DEQ will be proposing to repeal the exemption provided to electric generating facilities to the 2007 Montana Legislature since electrical generating facilities were removed from regulation under the Major Facility Siting Act in 2001. SME has voluntarily agreed to license the monofill and be subject to the requirements of the Solid Waste laws and rules. The license conditions would include installing a clay liner, appropriately managing the wastes, and installing a groundwater monitoring system in the vicinity of the monofill. DEQ would review and, if adequate, approve each element of the waste management and proposed monitoring system.

4.13.2.1 Construction

The construction of the potential power plant would generate large quantities of construction debris waste, which would require proper disposal or reuse. Construction is estimated to take approximately 2 ½ years, and would begin with site preparation, foundations, and underground

utilities, while design of the above-ground mechanical, piping, buildings, structures, and electrical systems is being finalized.

Any non-hazardous construction debris that could not be reused/recycled would be disposed of at the High Plains Sanitary Landfill and Recycle Center (HPSL). This landfill is licensed Class II landfill. The construction contractor would be responsible for ensuring that the waste material generated was properly disposed. Portable restrooms for employee use during the construction period would be provided by a private contractor. Portable toilets would be serviced by a septic tank pumper licensed by the DEQ to perform these services.

4.13.2.2 Operation

The operation of the potential 250 MW coal-fired power plant would produce large amounts of waste that would have to be disposed of or recycled in an environmentally acceptable manner. Proper maintenance and plant management should minimize any possible negative impacts associated with the production of large quantities of solid waste.

Ash and Water Treatment System Byproducts

The majority of solid waste generated from power plant operations would be ash. At full generation capacity, the plant would produce approximately 220 tons of ash and three tons of activated carbon per day. The ash would have a compacted density of approximately 75 pounds per cubic foot.

Ash is a coal combustion byproduct which can be recycled in some instances, or managed as a waste. Coal combustion wastes include large volume wastes, consisting of coal combustion products (CCPs), and low volume wastes. In 2002, approximately 117 million metric tons per year of large-volume wastes, consisting primarily of ash, were generated by coal burning power plants (Kelly and van Oss, 2004).

Federal regulations encourage the beneficial reuse of coal combustion byproducts, and currently, about one-quarter of all coal combustion wastes are reused in beneficial uses (EPA, 2000b). CCPs are classified as non-hazardous solid waste (EPA, 2000b); however, CCPs that are disposed of in off site landfills, surface impoundments, or used as mine backfill, are regulated under RCRA subtitle D, regulation for the disposal of certain non-hazardous solid wastes, and are thus subject to stricter federal regulation than reused CCPs. In Montana, CCPs disposed of in off-site landfills are subject to Montana solid waste laws and rules and are licensed and regulated by the DEQ as Class II landfills (ARM 17.50.508 and 509).

In general, CCPs, and specifically ash material, can be given away or sold. The material is often reused as a component of cement, road base, waste stabilization, soil stabilization, and other various construction materials. Two other general byproducts of coal-combustion air-pollution control technologies are flue-gas desulfurization (FGD) wastes (from pulverized coal-fired plants only) and fluidized-bed combustion wastes. In 2002, fly ash represented the major component (59 percent) of CCPs produced, followed by FGD material (23 percent), bottom ash (16 percent), and boiler slag (2 percent – from PC plants only). All CCPs have potential for beneficial reuse,

and the amount of material being reused has been steadily increasing since the mid-1960s. More than 80 percent of the boiler slag produced in 2002 was reused, followed by fly ash, of which 35 percent was reused (Kelly and van Oss, 2004). CFB boilers produce only fly ash and bed drain ash.

Because fly ash is the main component of CCPs, approximately 65 percent of all CCPs are not currently reused. By reusing the CCPs as much as possible in concrete, production of road base materials, manufactured aggregates, flowable fills, structural fills, embankments, waste stabilization, wallboard manufacturing, roofing tiles and shingles, snow and ice control, and soil modification, the power plant would be able to minimize the volume of solid waste. There are no current plans to recycle the ash from the HGS, but a beneficial use may be developed in the future.

Large volume wastes are categorized by the process in which they are generated in the coal plant and their application. Ash is the incombustible inorganic matter of coal, and on average, the ash content of coal is 10 percent (USEPA, 2004). The ash is composed primarily of metal oxides and alkali. Coarser ash material settles to the bottom of the combustion chamber, while the fine portion, fly ash, is removed from the flue gas.

Specifically, a hydrated ash reinjection system would convert SO_2 and other gases in the flue gas to a particulate to be captured in the baghouse (fabric filter) installed at the proposed power plant "downstream" of the boiler. The baghouse would collect the fly ash for disposal. Flue gas would enter the baghouse through an inlet plenum, and the particulate matter would be collected on the outside surface of the bags. Pulsating air would be used to remove the ash from the filter media and discharge the ash to the baghouse hoppers. The fly ash would be removed from the baghouse and transported to a filter separator and then to a storage silo. Bed ash would be removed from the fluidized bed and cooled in bed ash coolers. Cooled bed ash would be discharged into a storage silo, which would be sized for 3-day storage. From the silos, the fly ash and bed ash would be mixed with wastewater to control dust and then trucked to an ash storage landfill, where the wet ash would solidify (SME, 2004b). The total daily solid waste byproduct of the combustion process at the HGS would be approximately 223 tons of fly and bed ash.

In addition to the ash, the plant would produce approximately 2.8 tons per day of other solid waste byproducts from the water treatment system. This material would consist predominantly of particles suspended in the river water. This material would be dewatered to a thick slurry consistency and would be disposed of along with the ash or in an off-site licensed landfill.

Based on consultations with DEQ about solid waste management, SME plans to dispose of the ash that cannot be reused and/or recycled and water treatment system byproducts onsite within a constructed monofill located within the confines of the railroad loop, immediately southeast of the boiler. A design and application for the proposed ash monofil has been submitted to the DEQ. The licensing information contains all of the elements required of a Class II landfill in Montana. The design submitted consists of a recompacted clay lined cells with ET caps and appropriate revegetation and will be discussed in detail below. Once the area is properly zoned to allow for the operation of the plant and the monofill, the DEQ could issue a license for the operation of the monofill.

The monofill area within the rail loop would be laid out in a rectangular grid consisting of approximately 100 acres (40 ha). The monofill would be constructed as twelve cells in a 3 by 4 grid. Each cell would be an excavated pit approximately 36 feet (11 m) deep. Each cell would be sized to accommodate the ash produced during three years of facility operation. Once filled and covered, the monofill grid would have a height of roughly 22 feet (7 m) above grade and would have an overall footprint, at the perimeter, of roughly 1,700 feet by 2,600 feet (100 acres (40 ha)). Excavated material would be predominantly fat clays. These clays would be used to construct a compacted clay liner and perimeter containment berms with the balance stockpiled for use as final cover. Both liner and berms would be constructed in moisture controlled and compacted lifts.

Each cell would be designed as a self-contained unit. During initial construction, only one cell with the associated containment berms would be constructed. The cell would be used for ash and disposal. Toward the end of the first three year period, the second ash disposal cell would be constructed. Cover material and topsoil for the first cell would be obtained from the excavation for the next adjacent cell. Cover material for this second cell would be obtained from the excavation for the third cell. This process would continue until all cells have been constructed. As each cell was filled, final cover and topsoil would be placed, and the cell would be vegetated. The monofill facility would have a storage capacity for solid waste byproducts commensurate with the estimated life of the HGS – in excess of 35 years.

The monofill would be encircled by a raised perimeter containment berm constructed from on-site fat clays. This berm would ensure that surface waters do not drain into the monofill. Any storm water that fell within the berm would be contained within the monofill, where it would evaporate.

The monofill would operate continuously, as solid waste was produced by the plant. Ash and, if appropriate, filter slurry would be conveyed to the monofill by truck and would be dumped within the active storage cell. On a scheduled basis, tracked machinery would distribute and spread the solid waste. The material would have sufficient moisture to allow workability by tracked equipment. As the ash dries, it would form a hard lightweight cover similar to concrete. In this form, the ash would not be subject to wind erosion. If erosion should occur, an onsite water wagon would be used to moisten the ash and regenerate the hard cover.

As each cell is filled, a gravel layer 12 inches thick would be placed to provide a capillary break for the final cover. This would be followed by 48 inches of the material excavated from the adjacent cell and placed as final cover. This cover would be topsoiled with stockpiled material and seeded to minimize water and wind erosion. The seeded areas would be maintained along with the balance of the site landscaping for the life of the plant. Upon closure of the final cell, the site would be seeded and can be reused as appropriate. This design creates what is known as an ET cap. ET caps are designed to mimic natural soils and provide for the in-cap storage of all precipitation that does not run off. This storage and capillary action allows the plants to use the moisture throughout the growing season and promotes good vegetative cover. ET caps have been tested in Polson and Helena, Montana, as part of a national study. They are rapidly becoming the design standard for landfills due to their low maintenance and high performance in

the Montana climate. The DEQ has approved several designs of this type at Class II landfills across Montana. Designs of this type have also been used at other waste repositories in Montana.

Coal, like soil, rocks and other natural materials found in the earth's crust, does contain trace amounts of heavy metal elements. The burning of coal results in the release of heavy metals such as arsenic, boron, cadmium, chromium, copper, lead, mercury, selenium and zinc. Despite the large volumes of ash produced, the total quantity of heavy metals contained within the ash is relatively small, and an even smaller amount of these elements has potential for release to the environment.

The U.S. EPA has extensively studied the risk that coal ash presents to the environment and published reports in February 1998, March 1999, and May 2000 stating that ash resulting from the combustion of fossils fuels was not hazardous and did not need to be regulated as a hazardous waste under Subtitle C of the Resource Conservation and Recovery Act (RCRA) (USEPA, 2004).

Studies conducted by the University of North Dakota indicate that for most heavy metals, even if released directly into groundwater, the concentrations are low enough that they would not adversely affect drinking water quality. A U.S. Geological Survey (USGS) fact sheet states that a "standardized test of the leachability of toxic trace elements such as arsenic, selenium, lead and mercury from fly ash shows that the amounts dissolved are sufficiently low to justify regulatory classification of fly ash as non-hazardous solid waste." However, it is important to note that despite these relatively low concentrations, if improperly managed, coal combustion products can have a negative impact on the environment and pose a risk for groundwater and/or soils contamination (ACAA, no date).

As part of its license application, SME has submitted a No Migration Demonstration for the monofill to the DEQ. Waste management units have the potential to impact groundwater and SME has addressed the issue in the No Migration Demonstration submitted to the DEQ Solid Waste Program. The information submitted demonstrates that based on the unit design, the nature of the ash, and the soils and hydrogeology of the site, there would be no migration of contaminants from the waste management unit to the underlying aquifers. (PBSJ, 2006a) Class II landfills that meet the requirements of the No Migration Demonstration found in ARM 17.50.723 are exempt from liner and groundwater monitoring requirements. SME has voluntarily agreed to construct recompacted clay liners in the waste management cells and to monitor the underlying aquifer as part of an ongoing demonstration.

Other Wastes

Additional wastes generated from operations of the power plant include routine office and non-hazardous facilities wastes that would be disposed of at the HPSL. Wastes of potential concerns from the potential power plant operation include waste heat emitted into the atmosphere, and the buildup and release of low-volume wastes. Low-volume wastes from coal combustion would be generally aqueous and include boiler blowdown waste, cooler blowdown waste, coal pile runoff

waste, demineralizer regenerant, and boiler chemical cleaning wastes. Water would comprise a substantial portion of these wastes.

The characteristics of low-volume wastes are extremely variable and can contain various hazardous materials such as strong acids or bases, cadmium, chromium, lead, mercury, and silver (EPA, 2000). Unless properly managed, these wastes have the potential to oxidize and generate acids that could contaminate nearby water resources. The boiler blow down wastes and cooling tower blow down waste (both liquid wastes) would be discharged into the waste water stream which would be pumped to the City of Great Falls wastewater treatment facility. As noted above, the demineralizer regenerate waste would be used to reduce dusting by utilizing the slurry material in the bed ash and fly ash pug mills when loading the ash haul trucks. Finally, the boiler chemical cleaning waste would be captured in special containers to be tested for metal content. The level of metal concentration would determine the disposal method. If allowable, the slurry would be admitted into the wastewater stream and discharged to the City of Great Falls wastewater treatment facility. A dedicated, zero outflow evaporation pond would be constructed onsite to capture and manage all runoff from stored coal.

Other potentially hazardous wastes generated from the routine maintenance of a power plant could include waste oils containing solvent residuals, waste paint and paint thinner, and solvents and degreasers. Hazardous wastes would be disposed of off site at a licensed facility. The state of Montana does not have any permitted hazardous waste disposal sites, and any waste regulated as hazardous would have to be transported out of state by a DOT certified hazardous waste contractor to an appropriate facility. Hazardous waste disposal facilities are located in Salt Lake City, Utah, and Columbia Ridge, Oregon. Alternatively, some hazardous waste such as solvents may be cleaned and recycled onsite by a permitted handler such as Safety-Kleen.

The Waste Management Unit of DEQ’s WUTMB is responsible for regulating storage, treatment, and transport of hazardous waste and used oil for all hazardous waste generators in the State of Montana. The existence of hazardous waste and hazardous materials at the power plant would require a hazardous materials management plan and associated emergency and contingency plans. These plans would include training and handling guidelines for staff, procedures to follow in the event of a hazardous waste or hazardous materials spill or release, and a list of measures to mitigate such a spill or release.

The power plant would most likely be regulated as a "conditionally exempt small quantity generator" of hazardous waste. Conditionally exempt small generators must determine which of the wastes they generate are hazardous; keep records of any test results, waste analysis or other determinations used to characterize hazardous waste for at least three years from the date of final disposition of the waste. They may dispose of hazardous waste at a legitimate recycling facility, a permitted hazardous waste treatment, storage, or disposal facility, or a Class II municipal solid waste landfill. Either of the first two options would be used for disposing HGS’s regulated hazardous wastes.

4.13.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.13.3.1 Construction

The construction of the potential power plant would generate large quantities of construction debris waste, similar to construction at the Salem site. Any non-hazardous construction debris that cannot be reused/recycled would be disposed of at the High Plains Sanitary Landfill and Recycle Center (HPSL). The construction contractor would be responsible for ensuring that the waste material generated is properly disposed.

4.13.3.2 Operation

Disposal of fly and bed ash would not take place onsite at the Industrial Park site, because of the smaller footprint area. Instead, ash would be routinely disposed of at an off-site waste disposal facility and/or reused as an industrial byproduct. Disposal would have to be done at a solid waste management facility licensed by the DEQ.

Additional wastes generated from operations of the power plant at the Industrial Park site would be the same as those generated under the Proposed Action, the Salem site. All non-hazardous wastes that could not be reused/recycled would be disposed of at the HPSL and all hazardous waste that could not be cleaned and reused would be disposed of out of state at a permitted hazardous waste disposal facility. As a result of accepting the ash from HGS, HPSL would fill up faster than anticipated and would be either required to request an expansion of its facilities or shut down and decommission its facilities. In the later case, a new landfill would need to be developed for the Great Falls area. These impacts would not directly affect the Industrial Park site, but could have potentially significant impacts to HPSL and other users of that facility.

4.13.4 CONCLUSION

The No Action Alternative would not create any waste management issues at either the Salem or Industrial Park site, as no waste would be generated at the sites. However, by purchasing an equivalent amount of power from generation sources elsewhere, SME would be contributing indirectly to ongoing waste management impacts at existing generating stations in the region or at potentially new generating stations located outside of the region.

Construction-related impacts on waste management at the Salem site and Industrial Park site would be comparable to one another. Impacts would be of minor magnitude, medium-term duration, and small extent, and with a probable likelihood of occurring. The HPSL, which would accept all non-hazardous construction debris, has more than sufficient capacity to accept all the waste without impact to other waste generators within Cascade County. The overall rating for impacts on waste management from the construction phase of the power plant would be adverse and non-significant.

Operation-related impacts on waste management for the Salem site would be of moderate magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring. Ash and water treatment system byproducts would be disposed of in an onsite monofill which

would be managed with appropriate environmental controls, including groundwater monitoring. SME has submitted a No Migration Petition to DEQ, demonstrating that no waste or leachate would migrate off-site or infiltrate to groundwater. Other non-hazardous waste that would be generated during operation of the power plant would be disposed of at the HPSL. Hazardous waste generated at the site would either be recycled by a certified waste handler or transported out of state by a certified contractor to a hazardous waste disposal facility. The overall rating for impacts on waste management from the operational phase of the power plant at the Salem site would be adverse; these adverse impacts are most likely to be non-significant.

Operation-related impacts on waste management for the Industrial Park site would be of minor to moderate magnitude, long-term duration, and small extent, and have a probable likelihood of occurring. All non-hazardous waste generated during operation of the power plant, including ash, would be disposed of offsite. Hazardous waste generated at the site would either be recycled by a certified waste handler or transported out of state by a certified contractor to a hazardous waste disposal facility. The overall rating for impacts on waste management from the operational phase of the power plant at the Salem site would be adverse; and while impacts might likely be non-significant, there is some potential for impacts to become significant .

Waste management related impacts during the operation phase of the power plant would be slightly less for the alternative Industrial site than for the Salem site, as all waste generated from the Industrial Park site would be disposed of off-site. Overall, however, even given the volume, duration of impacts, and potential of contaminants, waste management impacts would likely be non-significant at both sites due to the Waste Management Plan, facilities and procedures which have been developed to handle wastes.

4.13.5 MITIGATION MEASURES

Mitigation measures would include entering into and establishing a binding voluntary agreement with DEQ for the licensing and regulation of any onsite waste disposal at the Salem site. This agreement would include the installation of a groundwater monitoring system and management of the monofill ash disposal site in accordance with DEQ rules. Issuance of the solid waste license requires certification from the city or county that the site is zoned appropriately. Until that happens, DEQ cannot issue a license even if all other permitting requirements are satisfied.

Additional measures consist of seeking out recycling opportunities for construction debris and the coal combustion products, including ash, generated by the power plant. These beneficial uses of ash have the potential to reduce the operating costs by limiting use of on-site heavy equipment and by reducing the amount of impounded material which could extend the life of the monofill. Any ash disposed of through alternate methods can be collected directly from the plant. If the volume and production rate of ash required is greater than the production capabilities of the plant at the Salem site, ash could be reclaimed from individual storage cells of the monofill.

4.14 HUMAN HEALTH AND SAFETY

4.14.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, the sites would continue to be maintained as agricultural land and no notable risks to human health and safety would occur at, or because of, the sites. However, by purchasing power from generation sources elsewhere, SME would be contributing indirectly to ongoing human health and safety impacts at different generating stations in the region or potentially at new generating stations located outside of the region. To the extent that other generation sources may be preexisting and under the purview of older, less stringent safety and emissions regulations, the No Action alternative could potentially be contributing to greater regional impacts on human health and safety. However, it is also possible that power purchases would be made from other recently-constructed or yet-to-be constructed generating facilities and/or non-fossil fuel facilities that equal or exceed HGS's health and safety performance.

4.14.2 PROPOSED ACTION – HGS AT THE SALEM SITE

An environmental site assessment of the Salem site determined that there were no recognized environmental conditions or concerns identified within a one mile radius of the site. Additionally, the Salem site is located a considerable distance away from the two National Priorities List (NPL) sites located within Cascade County. However, there are documented impacts from mining waste to soil, surface water and stream sediments in Belt Creek, which flows northeast of the site. Belt Creek, and the Missouri River north of the site, are listed as impaired water bodies which do not support the beneficial uses of aquatic life, coldwater fishery, and drinking water. Because human activities associated with the power plant at the Salem site would not conflict with any of these uses, the site itself is not considered to pose any risk to site workers and visitors.

4.14.2.1 Construction

The construction of a potential coal burning power plant would involve direct health and safety issues for workers. The National Institute for Occupational Safety and Health (NIOSH) considers construction to be a high-risk industrial sector. In 2001, approximately 9.6 million persons were employed in the construction industry. Fatal occupational injury rates in this industry ranged from 75.6 for ironworkers per 100,000 full-time workers to 6.0 for drywall installers, more than a 12-fold difference. Following ironworkers, the highest occupational injury rates for construction workers occurred in roofers, welders and cutters, construction laborers, and truck drivers (BLS, 2004). All construction activities on the power plant and associated facilities would be considered routine.

From Great Falls, plant access would be from southbound U.S. Route 87/89 to eastbound State Route 228 (Highwood Road) to northbound Salem Road. Under this alternative the combined Average Daily Traffic (ADT) of the Salem Road would increase considerably during the construction period, jumping from 36 vehicles in a day to a peak of about 1,340. On the

Highwood Road (SR 228), the ADT would go from 549 vehicles in a day to potential maximum of approximately 1850. Unlike the Salem Road, the Highwood Road is paved, so that even though both are one-lane each direction, it can accommodate greater traffic flow. Because of the increase in traffic, and the operation of heavy construction equipment on the roads, these areas could potentially face a negligible to minor increase in vehicular accidents during the construction phase.

4.14.2.2 Operation

During power plant operations, there would be no public access to the power plant and associated facilities. The entire plant site would be fenced as a part of the overall plant security plan. While specific site security arrangements have not yet been determined, vehicular and pedestrian access to the plant would be limited and controlled by some means.

The primary concern regarding human health and safety risks, as they relate to the operation of power plants, is the effect of air emissions, and in particular, mercury. A detailed description and analysis of the types, effects, and anticipated locations, of air emissions from the proposed plant can be found under air quality, Section 4.5. Emissions and air quality modeling conducted for this DEIS and DEQ's draft air quality permit indicate that modeled concentrations of pollutants from HGS are well below standards set by EPA and DEQ to protect public health and safety.

Like many naturally occurring materials, coal contains traces of radioactive uranium and thorium: an average of about 1 part per million (ppm) of uranium and 3 ppm of thorium. By comparison, the average brick contains about 8 ppm uranium and 11 ppm of thorium (NCRP, 1988). When coal burns, less than one percent of its radioactive contents are released into the atmosphere. The rest remains in the ash (USGS, 1997). Accordingly, there is relatively little accumulation of uranium and thorium deposited in the soil surrounding a coal fired power plant. Instead, the ash from coal burning retains most of the radioactive material, so it is somewhat more concentrated in the ash than it was in the original volume of coal. The concentration of uranium in fly ash is in the range of 10-20 ppm. By comparison, naturally occurring black shale rocks have uranium concentrations ranging from 11-18 ppm and commonly found phosphate rocks range from 17 to 120 ppm of uranium (USGS, 1997).

Because the concentrations of radioactive elements in coal and coal ash are roughly comparable to those in common materials such as bricks, exposure to coal ash would be roughly comparable to the radiation exposure from living or working in a brick building. That exposure provides a very small fraction of the average annual background radiation exposure experienced by a typical American (i.e. about 7 millirem/yr from brick as compared to about 360 millirem/yr on an overall average from all sources) (NCRP, 1988).

In regard to the small proportion of radioactive material that is released into the atmosphere, there are very little available data on the resulting exposure risk. EPA, however, cites a figure of 0.03 millrem/yr radiation exposure within 50 miles of a coal plant (EPA, 2006f). Given the overall average background exposure of 360 millirem/yr for the average person, this EPA figure

would suggest that living near a coal plant is not likely to increase a person's radiation exposure by more than a very small amount.

In addition to air emissions, the large quantities of solid wastes that are generated from coal combustion activities can pose a risk to human health and safety if improperly analyzed and disposed of. In 1999, EPA conducted a risk assessment that found a lack of potential human health risk for virtually all coal combustion waste constituents. Arsenic was the one constituent for which EPA identified potential human health risks (EPA, 1999a). Arsenic was found to pose a potential human health risk via two pathways: 1) via the groundwater pathway where these wastes are managed in unlined landfills and surface impoundments, and 2) via non-groundwater pathways where these wastes are used as soil amendments for agricultural purposes. The identified risks in both these pathways are based on high-risk scenarios in EPA's risk modeling analysis for either the ingestion of wastewater influenced by releases from the waste management unit or from direct human ingestion exposure routes.

Transmission Line Corridor(s)

In the recent past, concerns have been raised about the health effects of powerful Electro-Magnetic Fields (EMF) emanating from high-voltage power lines that pass through populated residential areas. However, scientific studies appear inconclusive, with no consistent, significant link detected between EMF and cancer (Hafemeister, 1996). The generally low population density of Montana suggests that fewer people may be exposed to EMF from a new power line than in more populous areas of the country. Furthermore, the proposed transmission interconnectors from the HGS would not be routed near any residences.

4.14.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

The alternative site is located in a historically and actively developed industrial siting area. During an environmental site assessment of the Industrial Park site, two Resource Conservation Recovery Information System (RCRIS) small quantity hazardous waste generators and a Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) – No Further Remedial Action site, were identified within a ¾ mile radius of the site. Additionally, the ESA identified one State hazardous waste (CECRA) site and one State Leaking Underground Storage Tank (LUST) within one mile of the Industrial Park site. None of these locations, however, were determined to pose an environmental threat to the proposed Industrial Park site, and no recognized environmental conditions or concerns were identified within a one-mile radius of the site.

The Industrial Park site is also located a substantial distance away from the two NPL sites located within Cascade County, and there are no impacts from mining in the water bodies adjacent to the site. The Missouri River flows south and east of the site and is listed as an impaired water body which does not support the beneficial uses of aquatic life, coldwater fishery, warm water fishery, and drinking water. Because human activities associated with the power plant at the Industrial Park site would not conflict with any of these uses, the site itself is not considered to pose any risk to site workers and visitors.

4.14.3.1 Construction

The construction of a potential coal burning power plant would involve similar direct health and safety issues for workers as described above under construction of the Salem site. All construction activities on the power plant and associated facilities would be considered routine.

From Great Falls, plant access would be from northbound U.S. Route 87. Under this alternative the combined ADT of the U.S. 87 would increase notably, going from 7,718 vehicles in a day to a peak of just over 9,000. Most of the project-related traffic would occur during both the morning and afternoon commutes, when a peak of approximately 550 vehicles per hour (estimated maximum) could be entering and exiting the construction site. This amount of traffic is believed to more than double the amount of vehicles accessing Route 87 between the hours of 6 and 7 a.m. and 3 and 5 p.m. Because of the increase in traffic, and the operation of heavy construction equipment, this area of U.S. Route 87 could potentially face a negligible to minor increase in vehicular accidents during the construction phase.

4.14.3.2 Operation

Impacts of the operation of the power plant to human health and safety at the Industrial Park site would be similar to those discussed under the Salem site. During power plant operations, there will be no public access to the power plant and associated facilities, and the entire plant site would be fenced as a part of the overall plant security plan.

The quantity and quality of air emissions would be the same as under the Proposed Action. A detailed write-up on the types, effects, and anticipated locations, of air emissions (including mercury) from the plant at the Industrial Park site can be found under air quality, Section 4.5. Because the area surrounding the Industrial Park site has a greater concentration of residential areas than the Salem site, there could be some amount of additional exposure of local residents to air emissions.

4.14.4 CONCLUSION

The No Action Alternative would not create any notable risks to human health and safety at, or because of, the sites. However, by purchasing power from generation sources elsewhere, SME would be contributing indirectly to ongoing human health and safety impacts at different generating stations in the region or at potentially new generating stations located outside of the region. To the extent that other generation sources may be preexisting and under the purview of older, less stringent safety and emissions regulations, the No Action alternative could potentially be contributing to greater regional impacts on human health and safety.

Construction-related impacts on human health and safety at the Salem site and Industrial Park site would be relatively comparable to one another. Impacts would be of minor magnitude, medium-term duration, and small extent, and with a probable likelihood of occurring. Construction of heavy industrial facilities would expose construction workers to short-term health and safety risks typically faced in the construction industry, considered high-risk by the National Institute for Occupational Safety and Health (NIOSH). Additionally, traffic volumes

and the presence of heavy construction equipment on site access roads could potentially cause a negligible to minor increase in vehicular accidents. The overall rating for impacts on human health and safety from the construction phase of the power plant would be adverse and non-significant.

Operation-related impacts on human health and safety for the Salem site and the Industrial Park site would be of minor magnitude, long-term duration, and medium extent, and have a probable likelihood of occurring. A coal-fired power plant would emit an additional minor increment of mercury to the environment, thereby contributing incrementally to this cumulative problem; however, as discussed in more detail under Air Quality, these emissions are not likely to cause any health problems locally. The overall rating for impacts on human health and safety from the construction phase of the power plant would be adverse and most likely non-significant.

Impacts to human health and safety at the Industrial Park site are potentially a little greater than at the Salem site, due to its proximity to a greater number of residential areas. This distinction, however, is not large enough to classify the impacts from the power plant sited at the Industrial Park as being major or even moderate. Direct and indirect impacts to human health and safety in the local Great Falls area itself would probably be minor. Overall, the operation of a new, well-controlled CFB power plant at either the Industrial Park site or the Salem site represents negligible to minor human health and safety concerns, by contributing a tangible but small increment to several widespread, chronic, cumulative environmental problems. The contribution of the power plant's operation to widespread, regional, national, and global concerns is minor and incremental, but the problems to which it would contribute are serious ones. Impacts of the plant at either site would be adverse and most likely non-significant.

4.14.5 MITIGATION

Mitigation measures during operation of the power plant include installing and operating all BACT methods of reducing air pollutants, including non-criteria pollutants such as mercury. Implementation of proper waste management procedures and water pollution control would further reduce any impacts from the plant at either location.

4.15 SOCIOECONOMIC ENVIRONMENT

4.15.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, no CFB coal-fired power plant would be constructed at either the Salem or Industrial Park sites. The direct and indirect economic benefits from a nearly half-billion dollar investment in the local economy and short-term (construction) and long-term (operation) job creation would be forgone under this alternative. However, this is not an adverse impact, but rather a lost opportunity to realize economic benefits to the local community from the Proposed Action.

Under the No Action scenario, by about 2012, SME would meet approximately 80 percent of its future base load electricity needs by means of a power purchase agreement(s) with one or more wholesale electricity provider in the WSCC and approximately 20 percent through its ongoing contract with WAPA.

Under this alternative, SME's member cooperatives and consumers would be unprotected from future increases in the price of electricity on the open market. Given the volatility of this market, and particularly that of natural gas prices – natural gas being one of the major fuels used to generate electricity in the northern Rocky Mountain West and Pacific Northwest, geographic areas covered by the WSCC – consumers could be paying substantially higher electric rates, although it is not possible to quantify precisely how much higher. It is not unreasonable to suppose that rates could be 20 percent to 100 percent higher. The higher electric rates for residential, commercial, and industrial consumers of electricity in the SME service area could potentially induce several direct and indirect effects.

Assuming a residential consumer decides to maintain pre-price-increase electricity consumption levels and pay more for the same electric service, potential direct effects for residential consumers of higher electricity bills would include less disposable income for other household expenditures. Thus, spending on goods and services in the local economy and therefore contributions to local economic activity would be reduced. The magnitude of this reduction would not be expected to be large (more than a few percent), in that a typical household's expenditures on electricity would constitute only a small percentage of its annual expenses. Nevertheless, in aggregate, reduced spending would ripple through the local economy, inducing effects such as modest job and income losses in the retail trade, arts, entertainment, recreation, accommodation and food services industries.

If the residential consumer decides to conserve electricity and/or use it more efficiently in response to higher rates, this could take the form of "doing without" or deprivation (e.g. reducing lighting levels, lowering the thermostat in winter and raising it in the summer) and/or installing more energy-efficient appliances such as refrigerators, compact fluorescent light bulbs, systems such as geothermal heat pumps and insulation, and more effective home insulation. Residential consumers could potentially feel less comfortable in their homes and possibly could be exposed to conditions that pose risks to their health and safety. This adverse effect would fall harder on lower-income residents, especially the 10 percent or more of households below the poverty line in the counties within SME's service area. Furthermore, this population would be least able to afford additional insulation, newer, more energy-efficient refrigerators, washers, dryers, and so forth, much less the more technically sophisticated energy conservation/efficiency devices.

With regard to SME members' commercial and industrial customers, higher electricity prices, by raising production costs (industry) and the cost of doing business (commercial businesses) could also have a variety of potential effects. For any given firm or institution, the magnitude of these effects would depend on how large the relative cost of electricity is compared to other factors of production. Higher electricity rates could influence decisions on whether to locate or expand activities within SME's service area; some firms that are power intensive may choose to locate in other regions where electricity costs less. Higher rates could spur increased investment in energy efficiency and conservation technologies among commercial and industrial customers. They

could also lead to structural changes in the economy within SME's service area; less energy intensive industries would be favored while more energy intensive industries would be disadvantaged.

4.15.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.15.2.1 Construction

SME and Stanley Consultants estimate that construction of the HGS at the Salem site would take approximately 4 ¼ years (51 months) from the start of ground breaking to commercial operation of the plant. Construction would begin with site preparation, foundations, and underground utilities, while design of the above-ground mechanical, piping, buildings, structures, and electrical systems is being developed. Construction would take approximately four years and three months in all and would employ an average of 300 to 400 workers at any one time with an estimated peak construction workforce approaching 550.

During different phases of construction different categories of workers would rotate in and out of the site, with a small percentage of supervisors, engineers, and operations staff remaining onsite throughout the entire construction period. The first part of the construction process would involve civil and structural engineering work, and site preparation, including grading, and laying building foundations. The next phase would include steel work and rigging that would require the use of heavy machinery. After the setting of large structural components, welders, pipe fitters, machinists, and electricians would be on site to finish the project.

Wage rates for construction workers would vary from approximately $20/hr to close to approximately $40/hr. Most of the construction and engineering jobs would be highly-skilled, specialized, well-paying positions. The total cost of the 51-month project is estimated at approximately $515 million, of which approximately $100 million is construction labor (SME, 2005j).

Because of the specialized expertise required, the construction workforce is expected to be primarily drawn from outside the region. Based on a rough estimate that 75 percent of the power plant construction workers required would come from outside the region (SME, 2005j; Warren, 2004), the Great Falls area would see an increased demand on rental housing. These construction workers may rent apartments for the duration of their work, share hotel rooms with other workers, or drive a recreational vehicle (RV) to the area and stay at available sites during the week. Because many workers would live in their own RVs, the impact on the regional housing market would be minimized.

In the 2000 Census, Cascade County had 11,252 renter-occupied units (USCB, 2000b); given the county's overall vacancy rate of 8%, there would be roughly 900 vacant rental units in Cascade County. These vacant units, along with the more than 1,300 hotel rooms in Great Falls, could in all likelihood meet the housing demand for a majority of the temporary workers. With a large number of workers living in RVs during peak times or commuting from out of the region, the current housing stock could meet the demands of temporary workers. However, during special events in Great Falls, hotel rooms might not be available. Those workers who do not find

housing in the Great Falls area could commute from other parts of the county and other nearby counties.

Most of the workers would be living in the area temporarily and would therefore not bring their families. However, a relatively small fraction of the workers associated with the construction of the plant would stay for the duration of the project and could potentially relocate their families, becoming permanent residents of the Great Falls area. In an area with a population of over 55,000, this increase would be expected to have a small economic impact and little impact on public services such as public schools.

The construction of a $515-million power plant would also create a number of jobs indirectly from project-related spending and the spending decisions of workers. This effect, known as the employment multiplier effect, takes the impacts from project-related spending into account to determine the number of indirect or induced jobs created in the local economy by an action. With an estimated employment multiplier of 1.5 (GOEO, 2006), the 400 jobs created during construction of the plant could potentially result in the creation of as many as 200 additional indirect or induced jobs, for a total of 600 jobs created by the project. However, these jobs would be temporary and would last only for the duration of the construction phase of the project.

The construction and operation of a power plant has the potential to create both temporary and permanent jobs, generating additional wages and benefits to be spent in the local economy. Local commercial entities in the community might expect to see some short-term, increase in activity related to expenditures by the project workforce.

The Employment Multiplier

A "multiplier" is a number used by economists to determine the impact of a project on the economy. It is the ratio of total change in output or employment to the initial change (or direct change). For example, if an industry were to create 100 new jobs it would require materials and services from its supplying industries. If this increase in demand created 30 new jobs in the supplying industries, the employment multiplier would be 1.3 [i.e., 100 (direct) + 30 (indirect and induced)].

Businesses in the project area might see some beneficial economic effects from per diem expenditures (meals, incidentals, etc.) by workers during the time they are in the local area. Current per diem levels for the region are about $60 for lodging and $39 for meals and incidental expenses, for a total of nearly $100/day.

Overall, the construction of the HGS at the Salem site would have a primarily positive or moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. The creation of up to 400 construction jobs on average and the payment of approximately $100 million in wages to construction workers would be expected to result in a total, temporary economic stimulus for the Great Falls area from direct, indirect and induced effects of 600 jobs and $150 million in spending.

4.15.2.2 Operation

The operation of the HGS would require approximately 65 permanent employees with average salaries of $60,000 a year. The total annual payroll would be almost $4 million. These positions

include plant operations, maintenance personnel, and engineering staff. Although the operations phase would not officially start until after the completion of construction, most of the staff would start working at the halfway point of the construction process in order to become familiar with the plant. The plant would be fully staffed six months prior to the end of construction.

The addition of 65 well-paying, technical and professional jobs to the Great Falls region would create a minor, beneficial economic impact for the region. With a labor force of 35,000 in Cascade County as a whole, the addition of 65 new, permanent jobs plus the potential creation of approximately 105 additional jobs through indirect or induced employment from the employment multiplier effect of 2.6 for the "power generation and supply" sector in Cascade County. This would result in the addition of about 170 jobs in total, or 0.5 percent of total employment in the area. This would represent a modest beneficial effect on the local economy, but would not be significantly beneficial. The long-term, total economic stimulus to the Great Falls/Cascade County area would be about $10.4 million (2.6 x $4 million) annually.

Many of the workers holding the approximately 170 new jobs created directly, indirectly, or induced by the HGS would have families associated with them. Using the relationship between 2000 Census figures for total Cascade County population and total employment, each new worker would be associated with an additional 1.3 persons in each household. Thus, the 170 new jobs would result in total population growth of almost 400 residents. Using the same assumption used in estimating the impact of construction – that 75 percent of the new jobs would go to new residents (former non-residents who would settle in the area) and 25 percent to existing residents of the Great Falls/Cascade County area, then the total net, permanent population gain from proceeding with the HGS would be approximately 300, in comparison with 2004 populations for Great Falls of approximately 56,000 and for Cascade County of approximately 80,000. These are minor demographic changes.

An additional economic benefit of the project is the property taxes that SME would pay to the

The Employment Multiplier II

The Montana Governor's Office of Economic Opportunity ran an IMPLAN model for the "Power Generation and Supply" sector for Cascade County. They got a "Type 1" multiplier of 1.6 and a "Type 2" multiplier of 2.6. The "Type 1" multiplier includes the jobs at the plant and the jobs created as a result of the plant doing business with other businesses in the county. The "Type 2" multiplier adds jobs created as a result of individual plant employees spending in the local community. The 2.6 multiplier is rather high compared to most industries, which is expected given that the utility industry pays very well compared to most Montana industries (GOEO, 2005).

Direct, indirect and induced spending/labor is the "total economic stimulus." What this represents is the total effect of multiple rounds of spending once an initial capital infusion is made. A dollar enters the local economy, in this case in the form of wages or purchases made by the plant. In each successive round of spending some portion of the original dollar "leaks" out of the local economy for payments like taxes, or purchases from outside the local economy - cars, major appliances, or contracts with outside firms, etc.

The remainder stays in the local economy and gets re-spent again and again until all of the original dollar eventually leaks out of the economy. When all of the original dollar has leaked out, the total stimulus associated with that dollar is complete.

The difference between "Type 1" and "Type 2" is the question of how far analysts want to track the original spending. Both types capture the entire stimulus, but the Type II is more comprehensive. The distinction is more based on where one stops the calculation. For the sake of simplicity this analysis uses the 2.6 multiplier. It includes the total direct, indirect and induced stimulus to the local economy.

state, county, city, and school district. Assuming the taxable value runs close to the estimated construction value, and assuming a factor of 3% on all portions of the project (cooperative and city), the estimated 2005 property taxes would be as follows: to the state, $2,282,067; county, $1,664,338; city, $2,131,606; and school district, $3,075,079. The total annual property tax levy would be $9,153,090 (SME, 2005j).

Although no social surveys have been conducted for this EIS, based on widespread experience with similar large industrial projects elsewhere in the state and country, it is possible that some neighbors or nearby residents of the HGS would generally oppose the project on certain grounds, or find some aspects of such a large, new industrial facility in an area that has always been rural to be objectionable, even while supporting the project generally. However, the Proposed Action, at least for the plant site itself, would not bring about any residential relocation, and would not require the use of eminent domain or condemnation. The sellers of the property on which the HGS would be sited are willing sellers. It is unlikely to affect property values, assessments, and property taxes of surrounding rural, agricultural properties, which could continue to be used as farmland and rural residences.

SME would negotiate the purchase of easements with other property owners in the vicinity whose land may be required for transmission line and/or pipeline rights-of-way. When an easement is obtained, it is added to the title of the property, and it travels with the title through ownership transfers, forever restricting its use. Easements can be bought, donated, or negotiated on a specific piece of property. They are usually valid for an indefinite period of time; however, certain easements protecting natural environmental features have been valid for a specific timeframe, such as 30 years. It is most common for easements to be valid *in perpetuity*, and the entity holding it determines the period of time most suitable to its needs and goals. In the event that neither party could agree on mutually acceptable price for an easement or sale in fee simple, SME, working with the state or county, would have the option of resorting to eminent domain.

> **Easement**: The right of a person, government agency, or public utility company to use or restrict public or private land owned by another for a specific purpose.

Eminent domain is a power reserved by a government agency, usually at the state or local level, to use their legislatively-granted police power to condemn a piece of property for the "public use". "Public use" can include anything furthering the health, safety, and welfare of the general public. In condemning the property, the entity must provide "just compensation" for the property, or pay the market value of the land or structure at the time of condemnation. It is required that the exercise of the eminent domain power be rationally related to a conceivable public purpose (Callies et al., 1994), although a closely watched, very controversial 2005 U.S. Supreme Court decision based on Kelo v. City of New London, 545 U.S. 469 (2005) gave local governments the right to condemn private property on behalf of private developers whose actions are purportedly fostering broad economic development aims in an area (Anon., 2005). If eminent domain were to be used by local or state government on behalf of an entity like SME, the land would then be fully owned by that entity.

> **Eminent Domain**: A power reserved by a government agency, usually at the state or local level, to use its legislatively-granted police power to condemn a piece of property for the public use.

4.15.3 Alternative Site – Industrial Park Site

4.15.3.1 Construction

With one possible exception, the construction-related socioeconomic impacts of the Industrial Park site would be virtually identical to those of the Salem site or Proposed Action. Overall, the construction of SME's proposed generating station at the Industrial Park site would have a primarily positive or moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base.

The exception relates to the greater proximity of residential development to the site. Approximately seven groups of residences are located within one mile of the Industrial Park site, primarily along Black Eagle Road, Rainbow Dam Road, and Bootlegger Trail. The combination of increased worker and heavy equipment traffic, noise, and fugitive dust associated with a large construction project could prove a distinct inconvenience or annoyance for those individuals with less tolerance for these short-term environmental stresses.

4.15.3.2 Operation

As with construction, during its operational phase, the Industrial Park Alternative would have virtually identical socioeconomic impacts to those of the Proposed Action (HGS at the Salem site). Operation of the CFB coal-fired power plant would require approximately 65 permanent employees with average salaries of $60,000 a year. The total annual payroll would be almost $4 million. Approximately 105 additional indirect and induced jobs would be created via the employment multiplier effect for a grand total of approximately 170 new permanent jobs. The 170 new jobs would result in total population growth in the Great Falls and Cascade County of approximately 400 of which approximately 300 would be new residents in a county with a population of about 80,000.

Figure 4-19. New Homes Within 1 mile of Industrial Park site

The greater proximity of certain residents to the Industrial Park site could potentially expose them to various environmental stressors, including noise, air emissions and occasional fugitive dust, traffic, and views of industrial facilities rather than open space. While none of these impacts, which are covered in other sections, are significantly adverse in and of themselves, in combination they may degrade the quality of life for more sensitive nearby residents. However, residents close to a designated industrial park may not have expectations that it would resemble a natural park or even remain as empty lots and unused open space. For this reason, while the property values of the nearest residents could possibly decline, the magnitude of this decline is unlikely to

be significant. As with the Salem site, there would be no residential relocations associated with the Industrial Park site, as the City of Great Falls owns the land.

4.15.4 CONCLUSION

Due to the higher electric rates it would likely lead to for SME's members and consumers, the socioeconomic impacts from the No Action Alternative would be somewhat significant and adverse. Other aspects of the socioeconomic environment, such as changes in employment, changes in the tax base and residential relocation, would not be affected by the No Action Alternative. Since no construction and operation of a coal-burning power plant would take place at either the Salem or Industrial Park sites, the No Action Alternative would not result in any adverse impacts at either of these sites.

Summarizing socioeconomic impacts (in particular, on income) of the No Action Alternative using the impact significance definitions described at the beginning of Chapter 4 and presented for Socioeconomic Impacts ("Changes in Income") in Appendix J, the magnitude would be "minor", the duration would be "long-term", the extent would be "medium", and the likelihood is "probable". Overall then, the rating for socioeconomic impacts (income) from the No Action Alternative would be somewhat significant and adverse. Other aspects of the socioeconomic environment, such as direct or indirect changes in employment, changes in the tax base and residential relocation, would be minimal under the No Action Alternative.

Overall, the construction of the HGS at the Salem site would have a moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. Over the long term, during the operation of the HGS for 30 or more years, it would yield beneficial and potentially significant socioeconomic impacts on aggregate income, employment, and population in the City of Great Falls and Cascade County. It would also provide reliable electricity at reduced rates for SME's customer base.

Using the impact significance definitions described at the beginning of Chapter 4 and presented for Socioeconomic Impacts ("Changes in Income") in Appendix J, socioeconomic impacts on income, employment, and population of the Proposed Action would be of minor magnitude, long-term duration, medium extent, and the likelihood is probable. Overall then, the rating for socioeconomic impacts on income, employment, and population from the Proposed Action would be potentially significant and beneficial.

The rating for socioeconomic impacts on income, employment, and population from the Industrial Park Alternative would be same as for the Proposed Action, potentially significant and beneficial. The caveat is that the Industrial Park Alternative could have greater adverse impacts, though not likely significant ones, on the quality of life of nearby residents.

4.15.5 MITIGATION MEASURES

Since most of the socioeconomic effects from both action alternatives are beneficial, and the adverse effects are not significantly adverse, no mitigation measures are planned or proposed.

4.16 ENVIRONMENTAL JUSTICE/PROTECTION OF CHILDREN

4.16.1 NO ACTION ALTERNATIVE

Under the No Action Alternative, there would be no construction or operation of a power plant at either the Salem or Industrial Park sites. As a result there would be no direct impact or effect from a plant on disproportionate numbers of minorities, persons living in poverty, or children at the sites.

However, insofar as SME would need to meet energy supply needs in the service area by purchasing power from existing generation wholesale suppliers located elsewhere, SME's member cooperatives and consumers would be unprotected from future increases in the price of electricity on the open market. Given the volatility of this market, consumers could be paying substantially higher electric rates in the future under the No Action Alternative. Although it is not possible to quantify precisely how much higher, it is not unreasonable to suppose that rates could be 20 percent to 100 percent higher.

The No Action Alternative then, would preclude building a new power plant which would provide a consistent and reliable energy source for the service area. This could lead to indirect economic effects on commercial and residential populations within SME's service area.

Low-income residential consumers would be the most affected population group from increased electrical rates and higher electricity bills. This population group would be least able to afford to upgrade their homes with energy-saving measures, such as installing additional insulation or more energy-efficient appliances and heating systems, in order to lower their energy bills. As a result, low-income residents would potentially have to reduce their electrical usage and could be susceptible to insufficient energy and heating conditions in their homes. This could expose this population group to conditions that would pose risks to their health and safety.

4.16.2 PROPOSED ACTION – HGS AT THE SALEM SITE

4.16.2.1 Construction

The construction of the power plant at the Salem site, and the installation of its infrastructure, would have a negligible effect on disproportionate numbers of minorities, persons living in poverty, or children, as these population groups are not generally present at or near the Salem site.

There are only eight scattered rural residences located within three miles of the site. The closest residence is located approximately 0.5 mile northwest of the site and is owned by the current property owner of the Salem site. Though there would be nuisances such as noise, dust, and traffic associated with construction activities, these impacts would not cause an environmental justice or protection of children concern due to the lack of these affected population groups in disproportionate numbers in the areas impacted by construction activities.

4.16.2.2 Operation

The operation of the plant at the Salem site would create emission of air pollutants, noise, increased rail and road traffic, and visual impacts on adjacent lands. Additionally, the site would be an industrial facility situated amidst agricultural lands. The siting of the plant, and the reliable infrastructure and possible cogeneration energy that would be available in this area once the plant is operational, could potentially influence land uses in the greater vicinity of the site to become more industrialized. These impacts would have a negligible effect on disproportionate numbers of minorities, persons living in poverty, and children, for the same reasons as discussed above under construction impacts. Simply, these population groups are not generally present in disproportionate numbers at the Salem site or the areas affected by the Salem plant's emissions and other operational impacts.

4.16.3 ALTERNATIVE SITE – INDUSTRIAL PARK SITE

4.16.3.1 Construction

The construction of the power plant at the Industrial Park site, and the installation of its infrastructure, would have a negligible to minor effect on disproportionate numbers of minorities, persons living in poverty, or children, as the impacts associated with construction would generally be limited to the construction areas which are agricultural or industrial zoned areas. However, there would be nuisances such as increased noise, dust, and traffic associated with construction activities, and these impacts could have the potential to cause an environmental justice or protection of children concern due if these affected population groups are located in the areas impacted by construction activities.

There is a greater proximity of residential development to the Industrial Park Site compared to the Salem site, though it is by no means a highly populated area. Approximately seven groups of residences are located within one mile of the Industrial Park site, primarily along Black Eagle Road, Rainbow Dam Road, and Bootlegger Trail. These areas are primarily low-density single family home areas and have no known disproportionate number of minorities. Additionally, these residential areas have no known disproportionate number of persons living below the poverty level. In fact, several of the homes located nearest to the Industrial Park Site are newly constructed, relatively large and high-cost single family homes.

Although there would be no environmental justice issues associated with construction activities at the Salem site, children may be presumed to live in several of the residencies near the site. Mitigation measures taken to minimize construction impacts (e.g. employing the use of noise reduction equipment, dust suppression, limitation in the timing of construction), would decrease these impacts below the threshold of significance and should provide adequate protection to children living in the area.

4.16.3.2 Operation

The operation of a power plant at the Industrial Park Site would have the same air pollutant, noise, increased rail and road traffic, visual, and land use impacts as would operating the plant at

the Salem site. The Industrial Park Site, however, has the potential to cause a slightly increased risk of impacting children and persons living in poverty, due to the fact that the site is located in closer proximity to higher population areas and additional industrial sites. No impacts are anticipated to a disproportionate number of minorities, as Cascade County does not have disproportionate numbers of minority groups.

The current burden from existing facilities emitting criteria air pollutants to residents and children living below the poverty line in Cascade County is approximately twice that of the burden to families and children above the poverty line (Scorecard, 2005). Though there are no known concentrated areas of poverty within the areas of impact from the proposed plant's air emissions, consideration was given to not exacerbating the emissions of existing facilities located within the area of impact with additional emissions from the plant. In other words, hypothetically the emissions from the proposed plant could be compounded by other industrial emissions in the vicinity which could potentially place an undue burden of air pollutants on residents downwind of the facilities, particularly children, and if present, low-income residents. The air quality permit analysis looked at the potential of HGS emissions to add to other industrial facility emissions. No additive impacts were found in this modeling of cumulative impacts.

4.16.4 CONCLUSION

There is not a disproportionate number of minorities in Cascade County, and none of the alternatives are expected to have an impact on a minority population group. Further, there is no evidence that siting of the proposed SME facility has targeted areas with disproportionately high levels of racial minorities or impoverished populations. Moreover, there has been no regulatory discrimination of enforcement standards where projects may affect those groups. Finally, there is no inequitable distribution of benefits, primarily economic, with project impacts such as increased pollution to those groups.

The No Action Alternative would involve no direct impact or effect from a power plant on persons living in poverty or children at either the Salem or Industrial Park sites. However, insofar as SME would need to meet energy supply needs in the service area by purchasing power from existing generation wholesale suppliers located elsewhere, SME's member cooperatives and consumers would be unprotected from future increases in the price of electricity on the open market. This could lead to indirect economic effects on commercial and residential populations within SME's service area, which could disproportionately affect low-income residential consumers. Low-income residential energy consumers would potentially have to reduce their electrical usage and could be susceptible to insufficient energy and heating conditions in their homes. These impacts would be moderate magnitude, intermittent-term duration, small extent, and possible likelihood.

The Proposed Action, construction and operation of a power plant at the Salem site, would have a negligible effect on children or persons living in poverty, as these population groups are not generally present at or near the Salem site. The Salem site and its adjacent land is low-density agricultural land, and though nuisances associated with construction and impacts from plant operations would affect areas within this land, there are no particularly susceptible population

groups present in significant numbers within the area to cause concerns regarding environmental justice or protection of children.

Construction and operation of the power plant at the Industrial Park site would involve the same impacts as at the Salem site, however, there is some potential of a slightly increased risk of impacting children and persons living in poverty from this site, due to the fact that it is located in closer proximity to higher population areas and additional industrial sites. The emissions from the proposed plant hypothetically could be compounded by other industrial emissions in the vicinity which could potentially place an undue burden of air pollutants on residents downwind of the facilities, particularly children, and if present, low-income residents. However, during modeling of cumulative air quality impacts conducted as part of the air permitting process, this hypothesis was largely discounted. It is currently considered an impact of minor magnitude, long-term duration, medium extent, and having an improbable likelihood of occurring. Overall impacts would be adverse but non-significant.

4.16.5 MITIGATION MEASURES

Since there are no significant, adverse impacts from the action alternatives anticipated on disproportionate numbers of minorities, persons living in poverty, or children, no mitigation measures specific to Environmental Justice issues are planned or proposed for either of the action alternatives. However, mitigation measures taken to minimize construction and operation impacts to other resource areas (e.g. reduction in noise, visibility, and air quality impacts) would also directly lessen the impacts to any sensitive or susceptible receptors in the impact areas, including children, minorities, or persons living below the poverty level.

4.17 EVALUATION OF RESTRICTIONS ON PRIVATE PROPERTY

MEPA provides that a state agency is required to prepare a regulatory restriction analysis that analyzes alternatives to reduce, minimize, or eliminate regulatory impacts on private property. Alternatives and mitigation measures designed to make the project meet minimum environmental standards specifically required by federal or state laws and regulations are not required to be evaluated as a regulatory restriction if the agencies have no discretion to alter or waive them. Components of the alternatives that are taken from permit applications, such as the MPDES, Air Quality, and 404(b)(1) permits, are also considered non-discretionary. However, if DEQ does not have the authority to impose mitigation, it is considered discretionary, and the impact of the cost of that mitigation must be disclosed.

Were DEQ to deny the air quality application under the No Action Alternative, SME would be required to make other arrangements for provision of electricity to its customers, which could increase its cost. Were DEQ to require the location of the power plant at the Industrial Park Site as described in Section 2.2.3, there would be increased costs because fly ash would need to be hauled off site. Also, there would be the loss of 6 MW of wind power should the Industrial Park Site be selected. However, no discretionary regulatory restrictions would be imposed under either of these alternatives.

For the Salem Site as described under the Proposed Action in Section 2.2.2, DEQ is not proposing any requirements that are not required by state law or rule. Because DEQ does not have authority to modify the requirements at the Salem Site, there are no alternatives that would reduce regulatory impacts on private property.

During the Section 106 consultation process, a number of mitigations to reduce impacts to the NHL from locating the power plant at the Salem Site were discussed. A mixture of mitigations that would directly affect the Salem Site as well as other off-site mitigations associated with the Lewis and Clark Trail were developed. This resulted in $480,000 of on-site mitigations which included relocating the power plant footprint outside the NHL boundary. That mitigation has already been incorporated into the Proposed Action in the final EIS. Off-site mitigations include property acquisitions and a variety of assistance to programs at the Lewis and Clark Interpretive Center and Library including $16,000/year for 30 years plus an initial $75,000 payment. These cultural mitigations would total $1,035,000 over the estimated 30-year life of the power plant (see Table 4-18), subject to agreement of the agencies involved in the consultation process, including RUS. However, DEQ has no authority to impose these cultural mitigations should the Salem Site be selected and is therefore not proposing to impose them.

4.18 UNAVOIDABLE ADVERSE IMPACTS

The Proposed Action analyzed in this EIS is the construction and operation of the proposed HGS and wind turbines at the Salem site and the associated connected actions. The connected actions of the Proposed Action include the construction and operation of power transmission lines, a rail spur, and potable, raw water and wastewater lines. The construction and operation of the proposed HGS and the connected actions would result in some unavoidable adverse environmental impacts in the Montana and the United States. This section describes these impacts.

Soils, Topography, and Geology

Under the Proposed Action, the total area of disturbance for construction and operation activities would include the total footprint of the power plant, approximately 545 acres, and additional roadway, rail spur, and utility corridor zones. The wind turbines would require approximately 4.5 acres. The construction and operation of a power plant and its associated infrastructure would involve extensive site grading and excavation activities that would compact and displace a considerable amount of soil and alter the topographic contours of the Salem site and its vicinity. Removal of vegetation and compaction would occur in the work areas, with potential impacts on erosion. Soil displacement and compaction would occur during site grading and use of access roads. Though the impacts associated with topography are considered negligible, because the site is generally evenly contoured already, the impacts to soil resources would be adverse and moderate in magnitude.

Table 4-18. Regulatory Restriction Costs on Private Property

On-Site and Off-Site Cultural Avoidance, Minimization, and Mitigation Measures for the SME HGS Cost Estimate Summary			
	Est. One Time Cost ($)	**Annual Cost ($)**	**Comments**
On-Site Avoidance, Minimization and Mitigation Measures:			
Shift the footprint of HGS outside NHL boundary	200,000		Air modeling $20,000; Geotech eval. $78,000; Additional engineering cost and support $96,000
Maximize use of downward directional lighting	50,000		Incremental cost for additional yard lighting
Use earth tone colors on HGS facilities	200,000		Stack and Coal Silo colored a sky blue
Evaluate use of landscaping around HGS	30,000		Upfront costs for design and options proposal
Total On-Site Avoidance, Minimization and Mitigation Measures:	*480,000*		
Off-Site Mitigation Measures:			
Attempt to acquire property at L&C Staging Interpretive Site - plant native vegetation	75,000		Estimated cost of approx. 40 acres
Assist in acquisition of properties near L&C Interpretive Center		2,500	
Assist in funding L&C Interpretive Center Library and Heritage Foundation HQ		2,500	
Set up annual contributions to L&C educational programs at Interpretive Center		5,000	
Provide in-kind electrical service to L&C Interpretive Center		6,000	
Total Off-Site Mitigation Measures:	*75,000*	*16,000*	
Total SME Avoidance, Minimization and Mitigation Costs:	***555,000***	***16,000***	
Total Life of Plant Cost:	***$1,035,000.00***		Assumed 30 year economic life for HGS

Water Resources

Construction and operation of the power plant at the Salem site would have adverse impacts on water resources from the increase in the amount of storm water runoff carrying sediment and contamination loads into surface water from the site, from the risk of contamination to ground water and surface waters in the vicinity of the site, and from the water withdrawals from the Missouri River and subsequent municipal water discharges. The water withdrawals from the Missouri River could reduce the river flows by 0.31 percent, representing an adverse but less than significant impact to the Missouri River flows downstream of the site. The subsequent discharge of wastewater into the City of Great Falls for treatment at its existing wastewater treatment facility would result in adverse but insignificant impacts.

Direct loss of wetlands and floodplains adjacent to the Missouri River would result from the construction and operation of the water intake structure in the Morony Reservoir and the installation of transmission line and pipeline within the River corridor. These impacts would be temporary, adverse and insignificant.

Air Quality

Impacts from the Proposed Action would result in adverse but not significant impacts on air quality. Impacts specifically related to construction activities would include exhaust and fugitive dust emissions generated by the operation of construction vehicles, which would cause adverse and moderate impacts to degradation of local air quality in the short term.

The Proposed Action would also cause a number of on-site and off-site impacts on air quality from operation activities. The emission of criteria pollutants and/or trace element deposition would cause adverse and moderate impacts to degradation of local air quality in the long term. Additionally, operation of SME's generating station would cause off-site impacts on PSD Class I increments and several AQRVs (visual plume, regional haze, and acid deposition), that would be adverse and of minor to moderate magnitude. None of these impacts would be significant in and of themselves, though they would contribute small changes to identified environmental resources that are affected by air quality impacts. Releases of greenhouse gases and mercury would be adverse and represent a minor incremental contribution to other air quality impacts.

Biological Resources

The Proposed Action would result in several adverse and moderate in magnitude impacts from construction and operation activities related to the plant and its associated facilities. Specifically, adverse impacts would result from the short-term harm to aquatic biota from degraded water quality; the long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the plant access roads; the increase in mortality to birds and bats from blade strikes on wind turbines; and the disturbance of wetland habitats during installation and operation of the water intake structure. These impacts combined would result in adverse though non-significant impacts on biological resources.

Acoustic Environment

Impacts of the Proposed Action would result adverse impacts on the acoustic environment. Noise levels associated with the daily operation of a typical 250-MW coal-fired power plant would be caused primarily by the Induced Draft fans, Primary Air fans, Secondary Air fans, transformers, cooling tower, turbine, boiler, coal crusher and trains for coal delivery. Intermittent noise sources associated with the power plant that would not significantly affect the daily operation L_{dn} but could be audible for several miles from the site, including steam line cleaning, start-up steam vents, tonal noise produced by the ID fans, and locomotives used to deliver coal.

The noise levels of typical daily plant operations are not predicted to exceed the EPA guideline of L_{dn} 55 dBA beyond 0.6 mile from the Salem site and are predicted to be approximately equal to the existing ambient noise levels during quiet periods at approximately 3.1 miles from the Salem site. The HGS power plant noise levels are predicted to be less than the 50 dBA nighttime noise limit of the Great Falls Municipal Code for residences, and less than or equal to the EPA L_{dn} 55 dBA guideline, at all of the receptor locations in the study area. Employee vehicle traffic and delivery truck noise is predicted to be less than MDT's L_{eq}(h) 66 dBA impact criteria at 50 feet from the plant access road.

Were it not for the presence of the National Historic Landmark, these noise impacts on Great Falls and the surrounding countryside and rural residents of the Salem site would not be considered significant. However, because of National Park Service Policy to avoid any degradation to natural ambient "soundscapes" in areas administered by NPS, construction and operation of the HGS would represent a significant long term adverse impact on the acoustical environment of the NHL.

Recreation

Construction and operation of the HGS and wind turbines at the preferred Salem site would result in adverse and minor impacts on recreation in the immediate project vicinity and wider Great Falls area. Though the Proposed Action would not restrict access to the recreational site in the immediate vicinity of the project area, the Lewis and Clark staging area historic site (part of the Great Falls Portage National Historic Landmark), the presence of the power plant 1.75 miles (2.8 km) to the south of the Lewis and Clark historic site would degrade the recreational experience there to some extent for the few visitors the site receives.

Cultural Resources

The Proposed Action would result in adverse and significant impacts on cultural resources from site preparation, staging, construction, maintenance, operations, and connected actions associate with the power plant, wind turbines water lines, transmission lines, rail supply lines. Specifically, the adverse and significant impacts on cultural resources would be a result of the effect that the visual presence of the power plant and its associated facilities would have on the historic scene and the visual landscape qualities of the Great Falls Portage National Historic

Landmark. While these impacts could be mitigated, they could not entirely be eliminated by proceeding with the Proposed Action at the Salem site.

Visual Resources

The Proposed Action, including the construction and operation of wind turbines and the proposed transmission line interconnections, would result in adverse and potentially significant impacts on visual resources. The primary reason for these adverse impacts is the large visual change the power plant, wind turbines, and the transmission lines would have on the scenic setting in the project area, and the effect the power plant power plant and its associated facilities would have on the scenic quality of the Great Falls Portage National Historic Landmark.

Transportation

The Proposed Action would result in minor, adverse impacts on traffic congestion from activities related to construction of the power plant and its associated facilities. Specifically, the combined average daily trips (ADT) of vehicles using Salem Road would increase considerably during the construction phase of the project.

Farmland and Land Use

Impacts from the Proposed Action would result in adverse, non-significant impacts on farmland and land use in the vicinity of Salem site. In the context of the amount of quality farmland in other areas of Cascade County, the actual conversion, or development, of the land required for the plant would be adverse and only a minor in magnitude impact. However, the influence and impacts of the power plant and its associated support facilities could indirectly influence land uses on adjoining or nearby properties in the vicinity of the site. The impacts associated with operating the plant could potentially cumulatively affect one particular area and be perceived as adverse enough to residents that they would choose to relocate. Over time this cycle could continue and the predominant land use in the area could change from being primarily farmland to being primarily industrial land. Additionally, the development of the Salem site in of itself may reduce market values of nearby rural, agricultural land. If property values were affected, there would be repercussions on land assessments and property taxes.

Waste Management

Construction and operation of the power plant at the Salem site would result in adverse and moderate in magnitude impacts on waste management. The impacts would primarily be a result of the large amount of debris generated from construction of the plant and its associated facilities, from the risk of leaching associated with the onsite disposal of ash and water treatment system, and from the risk of runoff from any waste piles temporarily stored on site.

Human Health and Safety

The Proposed Action would result in adverse and minor in magnitude impacts on human health and safety. Construction of the power plant and associated facilities would expose construction

workers to short-term health and safety risks typically faced in the construction industry. Traffic volumes and the presence of heavy construction equipment on site access roads could potentially cause a negligible to minor increase in vehicular accidents. The emission of an additional minor increment of mercury to the environment during plant operations would contribute incrementally to the problem of mercury accumulation in the biosphere, wildlife, and humans.

4.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA and MEPA require that environmental analysis include identification of "…any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented." This section thus describes irreversible and irretrievable commitments of resources associated with the implementation of the Proposed Action, as described in Chapter 2 of this EIS.

Irreversible resource commitments are related to the use of nonrenewable resources, such as soils, wetlands and visual resources, and the effects that the uses of these resources would have on future generations. Such actions are considered irreversible because their implementation would affect a resource that has deteriorated to the point that renewal can occur only over a long period of time or at great expense, or because they would cause the resource to be destroyed or removed.

Irretrievable resource commitment of natural resources means loss of production or use of resources as a result of a decision. It represents opportunities forgone for the period of time that a resource cannot be used. Irretrievable refers to the permanent loss of a resource including extinction of a threatened or endangered species, disturbance of a cultural site, loss of land production, or use of natural resources (including minerals and coal). For example, production or loss of agricultural lands can be irretrievable, while the action itself may not be irreversible.

Topography, Soils, and Land Use

The construction and operation of the proposed power plant, and its associated facilities and infrastructure, plus the wind turbines would require the commitment of approximately 550 acres of land for the plant footprint and additional land for roadway, rail spur, and utility corridor zones; and the excavation and/or grading of extensive amount of soil within this land. This commitment would be irreversible for the life of the power plant and the wind turbines. While it is possible that these structures, roads, rail spurs, and utility corridor zones could be removed and the natural landscape renewed, this is unlikely in the foreseeable future.

Water Resources

The consumptive use of 80 to 85 percent of the water diverted from the Missouri River during operation of the plant (which would range from 3,000 to 3,500 gallons of water per minute) would represent an irretrievable commitment of water resources. The diversion of surface water

would result in a reduction of the Missouri River flow downstream of the Morony dam by 0.31 percent. Additionally, there could be direct disturbance of a negligible amount of floodplains and wetlands as a result of the construction and operation of the water intake structure in the Morony Reservoir and the installation of transmission line and pipeline within floodplain and wetland areas of the Missouri River. The loss and/or degradation of floodplain and wetland areas could represent an irreversible commitment of water resources.

Biological Resources

The construction and operation of the power plant, wind turbines, and their associated facilities and infrastructure would result in limited irreversible and irretrievable commitments of natural and cultural resources. Vegetation would be irretrievably removed from the footprint of the plant and the additional land dedicated for roadway, rail spur, and utility corridor zone development. The areas occupied by structures as well as the access roads and maintained grounds, would be irreversibly removed from natural habitat for the duration of the existence of the plant. Although some sensitive species might be affected by construction, it is unlikely that threatened or endangered species or their habitat would be harmed.

Cultural and Visual Resources

The presence of the power plant, wind turbines, and their associated facilities would impact the visual and cultural resources of the Great Falls Portage NHL. This commitment of the Great Falls Portage NHL viewshed would be irreversible for the duration of the presence of the power plant and its facilities. While it is possible that the plant, wind turbines and associated facilities could be removed someday and the natural landscape of the area renewed, this is unlikely in the foreseeable future.

Construction Materials

Construction of the HGS and its secondary actions would result in both the irreversible and irretrievable use of construction materials. Many of the materials used for constructing the plant, transmission poles, and wind turbines, in particular the steel and other metals that would have to be committed, are ultimately recyclable but would remain an irreversible commitment of resources for the life of the project. Other construction materials, such as insulation materials, plastics, concrete, siding, piping, and so forth, would in large part likely represent an irretrievable use of materials, as upon any demolition of structures at the end of the project life, these materials would be ultimately disposed of at a landfill.

Moderate quantities of fossils fuels would be irretrievably consumed during the construction of the power plant, wind turbines, and their associated facilities. Diesel fuel and gasoline would be consumed by construction equipment such as bulldozers, backhoes, earth scrapers, motor graders, heavy haul trucks, large tractors, concrete trucks, asphalt pavers, concrete pavers, rollers, and compactors, and cranes, during the four years and seven months (51 months) estimated for completion of construction activities. Aviation fuel would be consumed by helicopters assisting in construction related activities. The consumption use of fuel during construction activities would not constitute a long-term drain on local resources.

Operation Materials

Operation of the power plant at the Salem site would result in the irretrievable commitment of several resources, including coal, limestone, ammonia, fuels, and processing chemicals. Coal consumption is estimated to be 259,300 lb/hr, or 1,135,800 tons/yr. Limestone and ammonia would be purchased and used to reduce air pollutants. Limestone would be consumed at a rate of approximately 5,780 lb/hr or 25,300 tons/yr. Ammonia would be consumed at 50 lb/hr (220 tons/yr).

Processing chemicals and maintenance chemicals such as oils, paint and paint thinner, and solvents and degreasers, would also be consumed during plant operations. In addition, all of the energy, fuels, and other materials, such as processing chemicals and maintenance chemicals, including oils, paint, paint thinner, solvents and degreasers, would also be consumed during plant operations and would represent irretrievable commitments of resources to the Proposed Action.

4.20 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

NEPA and MEPA require consideration of the relationship between short-term uses of the environment and long-term productivity associated with a Proposed Action. This involves the consideration of whether a Proposed Action is sacrificing a resource value that might benefit the environment in the long term, for some short-term value to the sponsor or the public.

In the context of the short-term uses of the environment associated with the operation of the HGS and the long-term impairment of environmental resources as they have been analyzed in this EIS, short-term refers to the that period of time encompassing the life span of the power plant and its associated facilities to the period of time encompassing the disassembly of the plant and subsequent restoration and rehabilitation activities. Long-term refers to that period of time following restoration and rehabilitation activities, during which consequent impacts from the Proposed Action still affect the environment.

The proposed short-term uses of the environment associated with the Proposed Action are the development of 545 acres of land for the footprint of the power plant and additional land for roadway, rail spur, and utility corridor zones; the consumptive use of 2,400 to 3,000 gallons of water per minute of Missouri River water; the direct loss of farmland, vegetation, wildlife habitat corridors, and floodplains and wetlands; and the consumptive use of coal, limestone, ammonia, and other nonrenewable resources.

Upon retirement and disassembly of the power plant and its associated facilities, the developed land would be returned to uses similar to the currently existing use of predominantly low to moderate valued farmland. The projected period before natural conditions return to an approximate pre-project status within the project area is expected to exceed several decades following completion of restoration activities. Organic content, biological activity, and horizon

development in the replaced soil surface layers of the project area would be expected to take an especially long time to approach background conditions. On the other hand, the long-term loss of productivity in the soils may eventually be greater than pre-project conditions, due to the continued loss of topsoil and organic constituents from current agricultural practices.

Water withdrawals from the Missouri River would cease immediately and concurrently with retirement of the power plant. As a result, flows in the Missouri River would recover the amount of water withdrawn for plant operations immediately following plant retirement. This may result in a temporary increase in erosion of the river banks as the velocity and volume of water flowing downstream of Morony dam could experience a negligible to extremely minor increase. River flow conditions would adapt and recover after several years at the most. Floodplains and wetlands restored following equipment removal and rehabilitation efforts would take several decades to recover pre-development characteristics. However, if restoration were to implement efforts to enhance riparian zones along the Missouri River, long-term productivity could eventually increase as compared to current conditions, which are characterized by limited productivity of area floodplains and wetlands.

Immediately following the disassembly of the power plant and its associated facilities, and regrading and revegetation of the project site, the viewshed associated with the Great Falls Portage National Historic Landmark could be restored, and the associated visual and cultural resource impacts could be mitigated.

To the extent that operation of the power plant contributes incrementally to the long-term forcing of climate change and global warming due to its air emissions including greenhouse gases, or contributes to the long-term increase in pollutant and trace metal deposition, this project could contribute in a minute but non-trivial way to potentially significant potential impacts on long-term productivity of terrestrial and aquatic ecosystems dependent on the climate system. The relative emissions from this facility, compared to national and global emissions, are discussed in this EIS.

The short-term social gains associated with the Proposed Action would result in beneficial long-term socioeconomic productivity in the vicinity of the project site. The Proposed Action would generate net socioeconomic benefits for the local and regional economy over the anticipated time of the project life and for several decades thereafter. Between 300 and 400 temporary construction jobs at any given time, and approximately 65 full-time jobs, would be created by the Proposed Action. Total payroll for the construction workers is anticipated to be approximately $100 million, and the total annual payroll for full-time employees is anticipated to be approximately $4 million.

The total economic stimulus to the Great Falls/Cascade County area during the life of the project would be about $10.4 million (2.6 x $4 million) annually. An additional economic benefit of the project is the property taxes that SME would pay to the state, county, city, and school district. Assuming the taxable value runs close to the estimated construction value, and assuming a factor of 3% an all portions of the project (cooperative and city), the estimated 2005 property taxes would be as follows: to the state, $2,282,067; county, $1,664,338; city, $2,131,606; and school district, $3,075,079. The total annual property tax levy would be $9,153,090.

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5.0 CUMULATIVE IMPACTS

In response to public comments, RD and DEQ have made several edits to the text of Chapter 5. Any additions or changed text in the FEIS from the DEIS as a result of public comments are shown in double underlining. Deletions are not shown.

5.1 INTRODUCTION

The mile-deep Grand Canyon of the Colorado River in Arizona is a dramatic illustration of cumulative impacts, although in this case from natural forces (erosion occurring over six million years) rather than human causes.

In the context of the NEPA and EISs, the Council on Environmental Quality's (CEQ) Regulations (40 CFR 1500-1508) implementing the procedural provisions of NEPA, as amended (42 USC 4321 et seq.), define cumulative effects as:

> the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other action.
> (40 CFR 1508.7)

Cumulative effects may be adverse, beneficial, or both.

Incorporating the principles of cumulative effects analysis into the environmental impact assessment of a proposed action should address the following:

- Past, present, and future actions;
- Other Federal, non-Federal, and private actions;
- Impacts on each affected resource, ecosystem, and human community; and
- Truly meaningful effects.

MEPA has a somewhat narrower requirement for considering cumulative impacts of proposed actions, as stated in Section 75-1-208, MCA:

> (11) An agency shall, when appropriate, consider the cumulative impacts of a proposed project. However, related future actions may only be considered when these actions are under concurrent consideration by any agency through preimpact statement studies, separate impact statement evaluations, or permit processing procedures.

Because the federal requirement for analyzing cumulative impacts is broader, this EIS will follow those guidelines, which call for the inclusion of future non-Federal and private actions in the cumulative impacts analysis, and not only those actions currently under consideration by an agency in permitting procedures or other environmental reviews.

In analyzing cumulative impacts, spatial and temporal boundaries must be selected. These form the context of the cumulative analysis. Judgment should be used in choosing the most appropriate boundaries to meaningfully assess the role of the proposed action, secondary actions and connected actions in comparison with overall effects from all past, present and future actions. If spatial and temporal boundaries are set too narrow, this will tend to overstate the relative importance of the proposed action compared with others, but perhaps reduce the overall cumulative scale of impacts to a misleadingly small magnitude. For example, with regard to some aspects of air quality (e.g. long range atmospheric transport of the acid rain precursors sulfur dioxide and nitrogen oxides), using the subject county's or even state's boundaries could amplify the role of a given project's emissions, while simultaneously diminishing the overall scale of the acid rain issue by artificially confining it to an area where it is not especially problematic.

In contrast, if spatial and temporal boundaries are set too broad, the contribution of the proposed action to cumulative impacts will be unduly small in comparison with the contributions of all other actions, but the overall scale of cumulative effects may be enormous and exaggerated. Consider the example of a proposed action that in conjunction with all others was predicted to lead cumulatively to the extinction of a given species. If a cumulative impacts analysis considered this phenomenon in the context of a geologic time scale measured in millions of years, during which time a number of species could disappear while new ones evolved, such an analysis would improperly diminish the significance of cumulative impacts leading to the permanent extinction of the species in question.

Ideally, natural boundaries should be used, but sometimes institutional or geographic boundaries are relevant as well, especially when certain key impacts weigh as much on the human environment as the natural environment. Spatial boundaries may also vary by resource topic. In the present cumulative analysis, Cascade County's boundaries may be the most appropriate for some resource topics, the state of Montana's the most appropriate for others, and the nearest reaches of the Missouri River for still others. However, a number of impacts to which the proposed action and secondary and connected actions contribute incrementally are much further away, much larger, or widely dispersed: the entire downstream length and watershed of the Missouri River, airsheds over the Rocky Mountains and Northern Midwest, the earth's atmosphere, and so forth.

In terms of temporal bounds for the cumulative analysis, a case can be made for starting with the post-World War II era, especially the 1950s, when the Great Falls area experienced substantial growth and development concurrent with the expansion of Malmstrom Air Force Base. Montana's population grew rapidly in the 1950s as well. The endpoint for the cumulative analysis could be set at 2040 – toward the end of the approximate design lifetime (thirty years plus) of the proposed HGS. However, any such fixed temporal boundary cannot help but be arbitrary, and thus the future boundary of cumulative impacts likewise varies by resource. The time frame of at least one potential cumulative impact – possible global climate change from anthropogenic (human) emissions of greenhouse gases like carbon dioxide and nitrous oxide and their accumulation in the earth's atmosphere – could extend centuries into the future.

Chapters 3 and 4 examined the affected environment and environmental consequences of the no action, proposed action, and alternate site alternatives with regard to 15 resource areas. Of these, only those resource areas impacted by one or more of these alternatives to a more than negligible extent, and other past, present, and reasonably foreseeable future actions, are included in the cumulative analysis.

Those resource topics for which the No Action alternative, Proposed Action, and/or alternate site were considered to have more than a negligible beneficial or adverse, direct or indirect, impact (and therefore possible additive effects with other actions) are shown in the following table. The alternative (#1 – No Action, #2 – Proposed Action, #3 – Alternate Site) or alternatives that are responsible for an identified adverse or beneficial impact are shown in parentheses.

Table 5-1. Summary of Direct and Indirect Impacts from No Action (#1), Proposed Action (#2), and/or Alternate Site (#3) Alternatives

Resource topic	Adverse impacts	Beneficial impacts
Soils, Topography, and Geology	• Negligible to minor, long-term adverse impacts (primarily erosion and loss of soil fertility) would continue from existing land use practices such as from grazing, tilling, disking, plowing, and movement of farm machinery (#1). • Extensive site grading and excavation activities that would disturb a considerable amount of soil and alter topographic contours (#2 & #3). • Soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent (#2 & #3). • Due to the operation of the waste monofill for the duration of the plant's life, operation-related impacts on soil resources would be minor magnitude, long-term duration, and small extent (#2). • Permanent increase in impermeable surface area and the risk associated with soil contamination from site runoff or leachate (#2 & #3).	

Water Resources	• Negligible to minor, long-term adverse impacts on receiving water quality would continue from existing land uses – runoff from agricultural lands can carry sediments, nutrients and other pollutants (#1). • Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination (#2 & #3). • Negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use (#2 & #3).	
Air Quality	• Exhaust emissions from equipment used in construction, coupled with likely fugitive dust emissions, could cause minor to moderate, short-term, localized degradation of local air quality (#2 & #3). • Coal-fired power plant would release nitrogen oxides, sulfur dioxide, particulate matter, carbon monoxide, volatile organic compounds, carbon dioxide, lead, and mercury (all). • Long-term minor to moderate degradation of local air quality from operations (all). • Long-term minor impacts on sensitive species from criteria pollutant emissions and/or trace element deposition (#2 & #3). • Short-term/long-term direct minor adverse impact on applicable PSD Class I increments (all). • Direct minor adverse impact on visual plume (#2 & #3) • Direct long-term minor adverse impact on acid deposition (all) • Direct short-term moderate	

	adverse impact on regional haze (all) • Emissions of mercury (all) • Emissions of greenhouses gases (mainly carbon dioxide) (all)	
Biological Resources	• Short-term impact to wildlife/vegetation by degrading air quality (#2 & #3). • Short-term impact to aquatic biota from degraded water quality (#2 and #3). • Long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on access road (#2 & #3).	
Noise	• Minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment (#2 & #3). • Minor long-term impacts from increased noise along route of train carrying coal to power plant (#2 & #3). • Long-term impact of noise from coal plant operation on receptors would be negligible to minor (#2 & #3). • Noise impacts on the NHL would be significant because of the degradation to natural ambient sounds.	
Recreation	• Negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area (#2 & #3).	

Cultural Resources	• Major, long-term impact on existing Great Falls Portage National Historic Landmark because of large, salient facility inserted into landscape relatively unchanged since 1980s listing and reminiscent of that which Corps of Discovery observed (#2).	
Visual Resources	• Scenic impacts on NHL of major magnitude, long-term duration, and small extent (#2). • Scenic impacts of moderate magnitude, long-term duration, medium or localized extent (#3).	
Transportation	• Construction-related impacts on road traffic would be of moderate magnitude, medium-term duration, and small extent (#2 & #3). • Minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect (#2 & #3).	
Farmland and Land Use	• Conversion of farmland would have impacts of minor magnitude, long-term (permanent) duration, and medium extent (#2 & #3). • Impact on land use (property values) from the operation of a power plant at Salem would be of moderate magnitude, long-term duration, medium to large extent, and possible likelihood (#2). • Impacts on land use from the operation of a power plant at the Industrial Park Site would be minor magnitude, long-term duration, medium extent, and possible likelihood (#3).	

Waste Management	• Construction impacts on waste management would be of minor magnitude, medium-term duration, and small extent (#2 & #3). • Operation-related impacts on waste management for the Salem Site would be of moderate magnitude, long-term duration, and medium extent (#2). • Operation-related impacts on waste management for the Industrial Site would be of minor to moderate magnitude, long-term duration, and small extent (#3).	
Human Health and Safety	• Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent (#2 & #3). • Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent (#2 & #3).	
Socioeconomics	• Socioeconomic impacts from potentially higher electric rates would be of minor magnitude, long-term duration, and medium extent (#1).	• During construction phase, moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base (#2 & #3). • During operation phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent (#2).

Environmental Justice and Protection of Children	• Impact on low-income residents of potentially higher electrical rates would be of moderate magnitude, intermittent-term duration, small extent, and possible likelihood (#1). • Impacts of plant operation on low income residents would be of minor to moderate magnitude, long-term duration, medium extent, and unlikely likelihood (#3).	

5.2 Past, Present, and "Reasonably Foreseeable" Future Actions

This section reviews relevant actions and trends that have already occurred, are underway at present, or may possibly occur in the future that may cumulatively interact with the No Action, Proposed Action (Salem site), and Alternate Site Alternatives (Industrial Park site).

5.2.1 Past and Present Actions and Trends

- Montana Pollutant Discharge Elimination System (MPDES) Permits: A total of 35 MDPES permits have been issued by DEQ within a 10-mi radius of Great Falls, MT. Three of these are municipal permits for Great Falls and Sun Prairie Village wastewater treatment, one is an industrial permit, two are concentrated animal feeding operations (livestock feedlots), and the rest cover storm water discharges. In most instances, the receiving water is the Missouri River (DEQ, 2005b).

  These discharges, plus numerous other point and non-point discharges upstream, have led to the "impaired" status of the Missouri River discussed in Section 3.2.4 of this EIS. The river is listed as not supporting the beneficial uses of aquatic life, coldwater fishery, warm water fishery, and drinking water. Probable causes of the river impairment include PCBs, metals, siltation, turbidity, and thermal modifications. Probable sources of the impairment are listed as being industrial point sources, dam construction, hydro-modification, and agriculture.

- Great Falls Industrial Park Development: In September 2005, the International Malting Company (IMC) began production at a $60-75 million malt plant with 35 employees and an annual payroll more than $2.3 million in the Industrial Park ("Agri-Business Park") north of Great Falls (Larcombe, 2005). Touted as the most automated malting plant in the world (GFDA, no date), the IMC plant is to have an annual malt production of 12 million bushels, which would require 11 million bushels of malting barley from

producers each year (Kramer and Owen, 2003). The City of Great Falls has extended sewer service to the IMC plant and plans to co-generate electricity at its existing wastewater treatment plant (Wilmot, 2005a). In addition, the City will sell 432,033 gallons per day of untreated Missouri River water to the IMC plant (Wilmot, 2005b).

- Coal-fired Power Plants: As of August 2004, Montana had five large generating stations using sub-bituminous coal as a fuel source: J.E. Corette in Yellowstone County (163 MW; opened 1968) and the four Colstrip plants in Rosebud County (348 MW, 358 MW, 778 MW, 778 MW; opened in 1975, 1976, 1984, and 1986, respectively). Each of these plants is a pulverized coal facility, and as such, emits criteria pollutants and other contaminants such as HAPs like mercury in amounts controlled by air pollution control technologies installed under authority of the federal Clean Air Act and the Montana SIP.

- Acid Deposition Effects on pH: In the latter half of the 20th century, acid deposition has impaired water quality and damaged aquatic life in thousands of small and large water bodies in North America – including ponds, lakes, streams and rivers – particularly in the Eastern and Upper Midwestern United States and Canada (EPA, 2003e). Especially vulnerable have been regions underlain by the poorly-buffered, ancient rocks of the Canadian Shield, or by other rock formations low in buffering capacity, that is, the ability to neutralize acidic inputs from rainfall and snowmelt. As the pH of these water bodies fell below 5.0 (neutral pH is 7.0, and 5.0 is 100 times as acidic as 7.0), populations of aquatic invertebrates and fish declined in tandem, disappearing almost entirely in the lowest pH systems and suffering severe reductions in others. In the West, acidification of water bodies has been much less problematic than in the East and Upper Midwest, due to several factors such as better buffered parent rocks and fewer overall SO_2 emissions.

  The Clean Air Act Amendments of 1990 and subsequent regulations addressed emissions of sulfur dioxide that are the major cause of acid rain and began the process of reducing these emissions nationally. They set a goal of cutting sulfur dioxide emissions in half. Emissions of both sulfur dioxide and nitrogen oxides have begun to decline, as has acid deposition in watersheds, but recovery of aquatic ecosystems is still in its incipient stages and may well take decades.

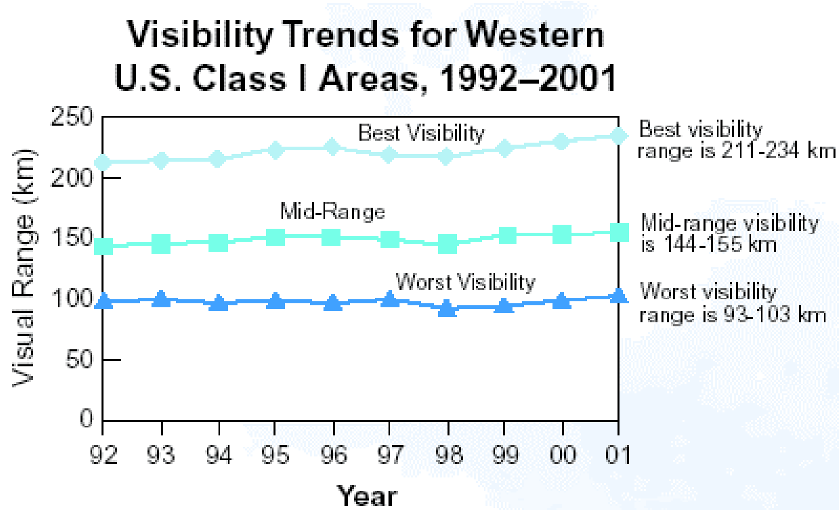
- Acid Precipitation and Forests: Acid rain can cause slower growth, injury, and in worst cases, the death of forests. It has been implicated in forest and soil degradation in many areas of the eastern U.S., especially in high elevation forests of the Appalachian Mountains from Maine to Georgia. In most cases, it appears that the combination of acid rain and other environmental stressors is responsible for declining forest health (EPA, 2003k).

- Acid Precipitation and Manmade Structures: Acid rain can also damage materials such as bronze, marble and limestone, leading to deterioration of cultural artifacts like statues made of these materials (EPA, 2003l). This problem has been documented in the East and in Europe much more than in the American West.

- Fossil Fuel Emissions and Visibility Reduction: In the latter half of the 20th century, as the U.S. population and economy grew to unprecedented levels, overall fossil fuel combustion roughly tripled to meet the rising energy consumption this growth entailed. Coal consumption alone quadrupled from 1950 to 2000 (EIA, 2001). Particulates and sulfur dioxide emitted to the air from burning coal are a dominant factor in the regional haze and associated visibility reduction that have compromised scenery in extensive areas of the country (NPS, 1997; Malm, 1999; EPA, 2003j). In Shenandoah National Park for example, located in Virginia's picturesque Blue Ridge Mountains, scientists estimate that the average visibility within the park has decreased from about 65 miles at the beginning of the 20th century to 15 miles toward the end of the 20th century (Connors, 1988). Sulfur dioxide particles or aerosols are not the sole cause of this, but they are the principal one, especially in the East, where SO_2 is estimated to cause some 60-90 percent of visibility reduction (Malm, 1999). In the West, sulfates are estimated to cause 25-50 percent of the problem (EPA, 2005g). EPA concludes that overall, the visual range in our nation's scenic areas has been substantially reduced by air pollution. In eastern parks, average visual range has decreased from 90 miles to 15-25 miles, while in the West, visual range has decreased from 140 miles to 35-90 miles (EPA, 2005e).

  Montana's Glacier National Park has been monitoring visibility since 1982 as part of a continuous nationwide monitoring program network called IMPROVE (Interagency Monitoring of Protected Visual Environments). At Glacier NP, visibility is greater than 200 miles less than 1% of the time, between 135-220 miles 10-25% of the time, 80-105 miles 40-60% of the time, 40-60 miles 10-25% of the time, and less than 10 miles less than 1% of the time (GNP, no date). In 1997, on the worst visibility days in the national park, the contributions to visibility reduction from various pollutants were as follows: sulfates (37%), organic carbon (32%), crustal material (11%), elemental carbon (10%) and nitrates (10%) (EPA, 2005f). The percentages of pollutants impairing views at Yellowstone National Park are fairly similar. According to visibility monitoring, the visual range at both these parks improved slightly during the decade of measurements between 1988 and 1997 (EPA, 2005f). In the West as a whole, visibility in Class I areas remained relatively unchanged between 1992 and 2001 (Figure 5-1) (EPA, 2005g).

Figure 5-1



Source: EPA, 2005g

- Mercury Contamination: An extensive discussion of mercury emissions, deposition, pathways, transformation into methylmercury, neurotoxicity and potential ecological effects is contained in Chapter 3 of this EIS (Section 3.3.4) and will not be repeated here. To briefly summarize, mercury levels in the biosphere have increased by several factors in the past few centuries over natural background levels as a result of increasing industrial and domestic use of this versatile liquid metal, burning coal in power plants, and incinerating medical and municipal waste. As elemental mercury vapor, this toxin is transported through the atmosphere all over the world, so that it is truly a global problem. U.S. emissions, which were reduced roughly in half (from 221 to 112 tons) between 1990 and 1999 now comprise an estimated three percent of global mercury emissions. Coal-burning power plants are now the single largest remaining source of anthropogenic mercury emissions in the U.S. (see Figure 3-22; EPA, 2006b). A majority of the mercury deposition in much of the U.S. is believed by scientists to originate outside of North America, mostly in Asia. However, the nature and extent of local deposition creating possible "hot spots" of mercury from coal-burning power plants continues to be studied.

  The main concern about mercury's health effects on humans and wildlife revolves around the consumption of fish that contain the compound methylmercury. Montana is one of a number of states with consumption advisories on fish containing methylmercury and other toxins caught in certain water bodies in the state. The advisories are designed to protect especially vulnerable segments of the public (in particular, pregnant women and young children) from the potentially toxic effects of excessive mercury ingestion through eating fish. While the number of fish consumption advisories has been increasing throughout the country in recent years, this may reflect more an increasing awareness and documentation of the widespread extent of mercury contamination rather than an actual increase in the level of contamination.

- Global Climate Change: Rising fossil fuel combustion and clearing of forests worldwide have released CO_2, the main "greenhouse gas," at a rate greater than the biosphere's ability to fix or sequester this gas. As a result, carbon dioxide concentrations in the atmosphere have risen from 316 parts per million (ppm) in 1959, when measurements began in Hawaii, to 376 ppm by the year 2003 (Keeling and Whorf, 2004). These concentrations continue to climb in spite of tentative initial international efforts to address the issue begun in Kyoto, Japan in 1997. Although there is uncertainty and disagreement about the details, there is broad consensus among climatologists and atmospheric scientists at the Intergovernmental Panel on Climate Change (IPCC) that rising concentrations of CO_2 will generally warm and change the climate globally. Some scientists dissent from this majority view.

  Global temperatures are rising even now: global mean surface temperatures have increased 0.5-1.0° F since the late 19th century (EPA, 2000c). Among the predictions (with varying degrees of confidence) are substantial variation in the degree of warming from the poles (most warming) to the tropics (least warming), altered precipitation patterns, and an increase in the intensity, if not the frequency, of extreme weather events such as storms, floods, hurricanes, and tornadoes. If Global Circulation Models are

correct, global climate change also poses many ramifications for natural ecosystems, agriculture, and human health, and societies and economies generally.

- Missouri River Flows: Like many Western rivers, controversy surrounds management of flows in the Missouri River, in this case by the Army Corps of Engineers. In the case of the Missouri, unlike the Rio Grande, Colorado, and Platte rivers, this controversy has less to do with overall flow depletions from consumptive water use within the basin than with the seasonal regulation of discharge through the dams and reservoirs along the river in Montana, North Dakota and South Dakota and the different, competing needs of navigation, recreation, and wildlife interests. Figure 5-2 shows Missouri River annual runoff downstream of Montana (at Sioux City, Iowa) during the 20th century.

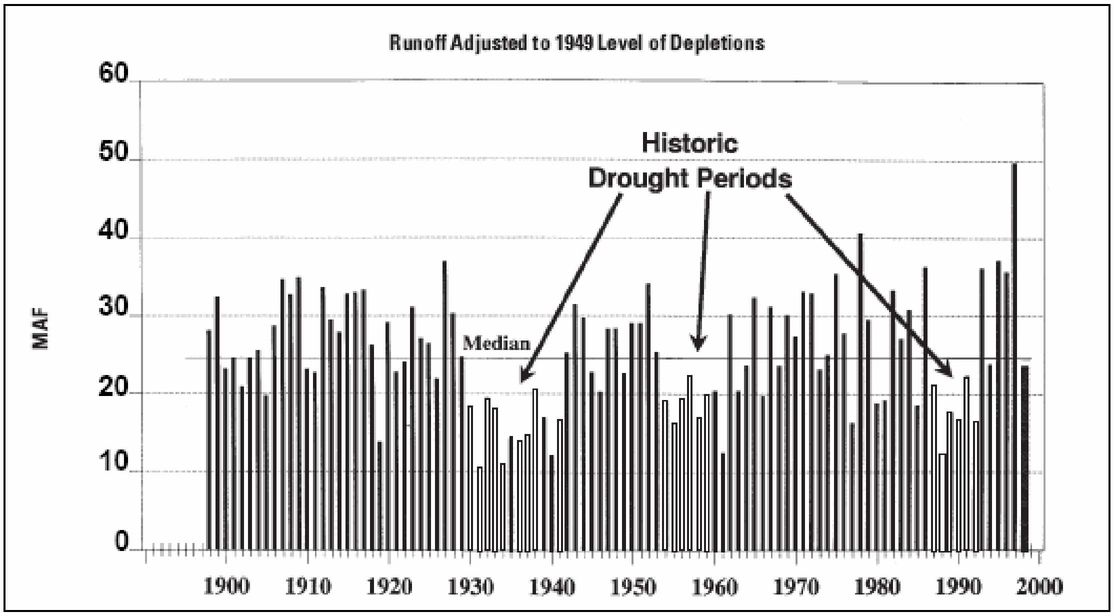


Figure 5-2. Missouri River – Annual Runoff (Million Acre-Feet) at Sioux City, Iowa
Source: USACE, 2004b

5.2.2 REASONABLY FORESEEABLE FUTURE ACTIONS AND TRENDS

- Proposed Transmission Line to Great Falls: The Montana Alberta Tie Ltd. (MATL) is proposing to construct, operate and maintain a 230-kilovolt electric transmission line on private land and State of Montana School Trust Lands between Lethbridge, Alberta and Great Falls, Montana (DEQ, 2005c). This approximately 190-mile line would connect the Alberta Interconnected Electrical System operated by the Alberta Electric System Operator (AESO), and Northwestern Energy's (NWE's) transmission system at the 230-kV substation just north of Great Falls (MATL, 2005).

  This project would be the first power transmission interconnection between the U.S. and Alberta; it is expected to facilitate development of additional generation sources (e.g., wind farms both in northern Montana and southern Alberta), as well as improve

transmission system reliability in Montana, Alberta, and on a regional basis in both the United States and Canada.

MATL's Major Facilities Siting Act (MFSA) application predicts impacts to physical resources such as geology and soils, air, and water, biological resources such as vegetation, wetlands, wildlife and fisheries, and sensitive (listed and proposed) species, and social resources such as socioeconomics, land use, utilities and transportation, visual resources, human health, recreation, cultural resources, and environmental justice. Most adverse effects identified are expected to be minor. The application also identifies potential cumulative impacts in the general Alberta-Montana corridor through which the proposed 230 kV transmission line would pass. Two of the highlighted biological cumulative impacts include the dispersion of noxious weeds along pipeline and transmission line right-of-ways and the potential for increased mortality of birds and/or bats from the growth of wind turbine facilities (MATL, 2005).

Missouri River Flows: In the basin as a whole, depletions from diversions for water supply and irrigation have become a factor in overall basin runoff and will be even more so in the future, especially as American Indian Tribes in the Missouri River basin begin to exercise their Tribal water rights (USACE, 2004).

- Proposed Coal-fired Power Plants: At present, at least four other coal-fired power plants in Montana are conceptualized or proposed, have received permits, or are under construction. These include the Roundup Power Project near Roundup (780 MW – a conventional pulverized coal plant), Rocky Mountain Power near Hardin (113 MW – pulverized coal), the Great Northern Power Nelson Creek Project near Circle (560 MW – CFB plus wind power), and the Otter Creek Power Project near Decker (3,000 MW – type undetermined) (WRA, no date). Thompson River Cogeneration near Thompson Falls (16.5 MW – coal and wood waste) has been constructed and operated for a short time but was not operating as of January 2007. Potential air quality impacts (especially reduced visibility) of the proposed Roundup plant in particular have generated concerns among the federal land managers, particularly the National Park Service and U.S. Fish and Wildlife Service, and have led to legal actions by environmental groups and initiation of a Clean Air Act dispute resolution process by the Northern Cheyenne Tribe. DEQ conducted an EIS on the Roundup plant, issued a Record of Decision in January 2003, and issued an air quality permit (DEQ, 2003). This permit is being challenged in administrative and judicial legal actions by environmental groups.

- Emissions and Visibility: While visibility impairment from sulfur dioxide aerosols and particulates remains a serious problem in scenic areas across much of the country, the fact that SO_2 emissions have now begun to decline promises that in the coming years the situation will improve (EPA, 2003j). For example, EPA estimates that its Acid Rain Program will improve the visual range (how far a viewer can see) in the eastern U.S. by 30 percent. This will be an especially welcome benefit for visitors to national parks and other natural areas celebrated for their scenic grandeur.

In Section 4.5.2.2.3, the regional haze analyses for both the proposed source only and the cumulative sources indicated that the HGS would not cause an adverse regional haze impact in any mandatory federal Class I areas and that the impacts would be minor to moderate. P. 82 of the draft air quality permit (Appendix I of this EIS) states that modeling predicts four days over 10 percent cumulative impact. However, this cumulative analysis includes only the existing emissions sources along with the HGS, not all potential future sources such as the coal-fired power plants cited above, as well as others that may follow over the longer term (but still within the likely 30-50 year project life of the HGS) if demand for electricity continues to grow in the West and lower-emission generation options like natural gas become more expensive, scarce, and less viable. At the same time, newer and future coal-fired thermal electric plants, some of which are replacing older, dirtier units, are being subjected to ever more stringent air pollution controls to comply with federal and state regulations. These two contradictory trends – increasing combustion of fossil fuels and tighter pollution controls – will certainly offset one another, but it is difficult to predict the net changes in total emissions and air quality that will occur in the Northern Rockies.

- “Clean Coal” Technology: The State of Montana offers tax breaks and loan guarantees to private-sector partners which would develop coal gasification technology and build one or more plants in Montana to convert the state’s coal reserves into liquid fuel and diesel (Montana Governor’s Office, no date).

- Mercury Emissions: Mercury emissions from coal-burning power plants are in the process of being regulated both federally (e.g. Clean Air Mercury Rule of 2005) and in Montana under rules established by the Board of Environmental Review. EPA’s Utility Mercury Reductions would reduce total coal-fired power plant mercury emissions by nearly 70 percent if fully implemented (EPA, 2004f). Montana’s mercury rules are in the same range. Montana’s mercury rules are more stringent than the CAMR, eventually limiting coal-fired generating stations with the capacity to generate more than 25 MW to no more than 0.9 pound of mercury per trillion Btu heat input.

- Montana Farmland: Between 1982 and 1997, total cropland acreage in Montana declined from approximately 17.2 million acres to 15.2 million acres, a decline of nearly 12 percent. However, much of this acreage was marginal cropland at least temporarily retired under the federal Conservation Reserve Program (CRP), which rose from zero acres to 2.7 million acres in Montana over the same period. Over the same 15-year interval, pastureland increased from 3.1 to 3.4 million acres and rangeland decreased slightly from 37.8 to 36.7 million acres (NRCS, 2000). Thus total agricultural lands including CRP lands decreased marginally from 58,098,000 acres to 58,085,000 acres between 1982 and 1997, an insignificant change. Developed land in the state increased slightly from 878,600 acres to 1,032,300 acres, which would have converted land from both agricultural and forested land uses to built-up (residential, commercial, agricultural, transportation) uses.

- Carbon Dioxide Emissions and Global Climate Change: The United States Senate declined to ratify and the current administration formally withdrew from the Kyoto

climate change pact that the U.S. and many other countries signed in 1997 in Japan. That would have committed the United States to reducing its aggregate CO_2 emissions to nine percent below its 1990 emissions by the year 2012. Instead, national emissions continue to grow unabated – greenhouse gas emissions in 2002 were 11.5 percent higher than 1990 emissions (EIA, 2003). Globally, the rate of CO_2 accumulation in the atmosphere appears to be accelerating. While there is still some uncertainty and scientific dissent, most scientists anticipate that average global surface temperature could rise 1 to 4.5° F (0.6 to 2.5° C) over the next fifty years, and 2.2 to10° F (1.4 to 5.8° C) in the coming century, with significant regional variation (EPA, 2000c). Strong economic growth in populous developing countries like China and India, which were exempted from making any cuts in national emissions at the Kyoto negotiations because of their poverty and low per capita CO_2 emissions, dims the prospects for reducing combined international emissions of the main greenhouse gas anytime soon. Nevertheless, over the 30 to 50-year lifetime of the proposed HGS coal-fired power plant, it could well be subjected to requirements aimed at regulating its carbon dioxide output.

The two unit coal trains per week that would provide fuel for HGS's boilers would emit carbon dioxide to the atmosphere from burning diesel fuel. Although this EIS does not attempt to quantify these emissions, they would only be a small fraction of HGS GHG emissions of about 2.8 million tons of CO_2 equivalent annually. Likewise, coal surface mining and reclamation consume fossil fuels, releasing additional CO_2. Emissions from these two connected actions would need to be added to a power plant stack's emissions in any comprehensive tally of coal-to-electricity's entire life cycle greenhouse gas emissions.

- Growth of Wind Energy: As discussed in Chapter 2 of this EIS, projects to capture wind energy with turbines and generate electricity are expanding rapidly throughout the United States. Montana itself has several recently completed or proposed wind projects. While newer, larger wind turbine designs with more slowly rotating blades have reduced mortality of wildlife principally in the form of collision by birds and bats, some mortality still occurs. Because wind turbine farms are still relatively new, the science of evaluating bird and bat strikes and devising avoidance and mitigation measures is still advancing. In its 2003 guidance, the U.S. Fish and Wildlife Service stated that it was still too early to reach definitive conclusions on the potential extent of cumulative impacts on given bird and bat species and populations around the country.

5.3 NO ACTION ALTERNATIVE

Under this alternative, no HGS would be constructed at either the Salem or Industrial Park sites. As its contract with BPA begins to be phased out, it is assumed that SME would purchase the electricity it needs to supply its member systems on the open, deregulated power market. In purchasing electrical energy from a possible variety of wholesale electricity suppliers in the region, SME would be contributing indirectly and incrementally to cumulative environmental impacts associated with the generation of electricity from various fuel/energy sources, possibly including natural gas, coal, nuclear, hydro, and to a smaller extent, wind and other renewables.

Thus, while there would be no contribution to cumulative impacts at the local and regional scales from construction and operation of a facility at either site, SME's contribution to cumulative impacts at the regional, national, and global scales – while impossible to isolate and quantify – would not be trivial. If the major source of generation were other coal-fired power plants, SME's contributions to cumulative impacts would be roughly on a par, or greater in the case of older facilities, with those from construction of HGS. Given power generation trends in the region, coal would likely become the dominant energy source as the decades proceed.

Table 5-2 summarizes cumulative impacts from the No Action Alternative.

Table 5-2. Summary of the Potential Long-term Cumulative Impacts from the No Action Alternative

Resource topic	No Action Alternative	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Socioeconomics	**	*	*
Environmental Justice	**	*	*

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

5.4 PROPOSED ACTION – HGS AT THE SALEM SITE

The Proposed Action would contribute to certain cumulative impacts, which are discussed briefly below and presented in Table 5-3.

Soils, Topography, and Geology – Extensive site grading and excavation activities would disturb a considerable amount of soil and alter topographic contours at the Salem site, and overall, soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent. Impacts from operation of the waste monofill for the duration of

the plant's life on soil resources would be minor magnitude, long-term duration, and small extent. Combined with other construction activities in the Great Falls area and Cascade County, plus general long-term degradation of agricultural lands from water and wind erosion (offset somewhat by setting aside CRP lands) and gradual loss of soil fertility, there would be an overall minor adverse cumulative impacts on soils from the Proposed Action and connected actions like pipeline and transmission line construction.

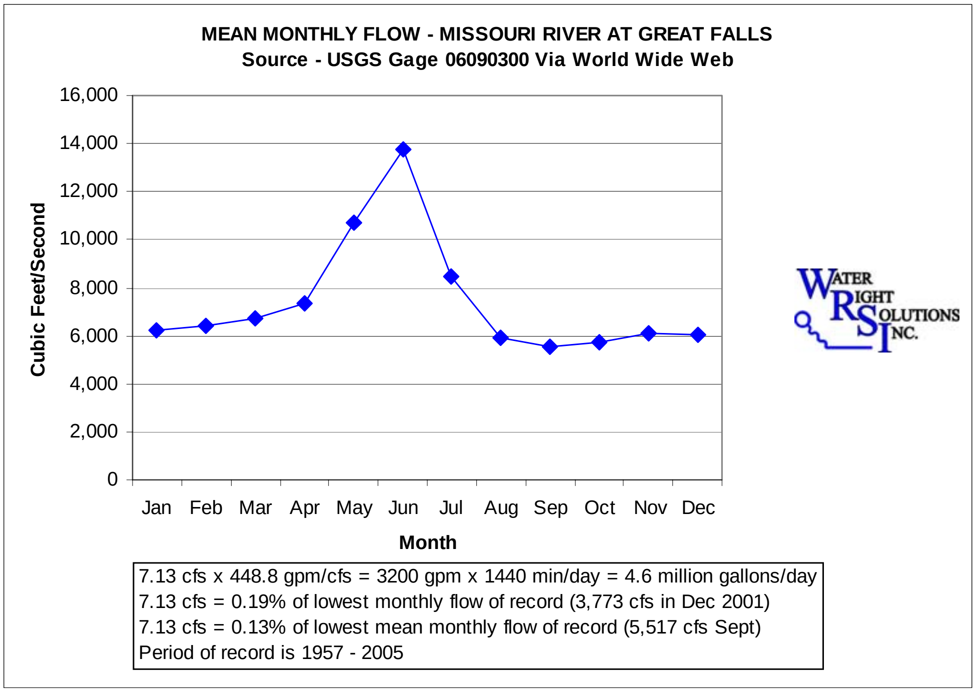
Table 5-3. Summary of the Potential Long-term Cumulative Impacts to which the Proposed Action would Contribute Incrementally

Resource topic	Proposed Action	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Biological Resources	*	*	*
Noise	*	*	*
Recreation	*	*	*
Cultural Resources	***	*	***
Visual Resources	***	**	***
Transportation	**	*	**
Farmland and Land Use	*	*	*
Waste Management	**	*	**
Human Health & Safety	*	*	*
Socioeconomics	++	+	+

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

Figure 5-3. Average Flows of the Missouri River at Great Falls, 1957-2005



Source: WRSI, 2006

Water Resources – Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination. Over the long term, there would be negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use. Basin-wide water quality and quantity (seasonal flows downstream) on the Missouri will likely continue to be problems in the future, and by using water consumptively, the Proposed Action would contribute incrementally to a negligible to minor degree toward these continuing, cumulative adverse effects. Figure 5-3 shows that HGS water withdrawals would amount to 0.13 percent of the lowest mean monthly flow of record (September).

By releasing some quantity of sulfur dioxide to the atmosphere, any new coal-fired power plant would also contribute incrementally to total national SO_2 emissions, and possibly, significant cumulative impacts on the water quality of the nation's water bodies from acid deposition. However, the distance of HGS from areas of the country and continent where acidification is a serious problem, primarily poorly buffered Canadian Shield parent rocks/soils of the Upper Midwest and Northeast – may mean that its SO_2 emissions have limited or negligible impacts on these vulnerable areas. While innovative regulatory tools (cap and trade program) and control technology under the Clean Air Act Amendments of 1990 have made substantial strides in reducing SO_2 emissions nationwide, the significant impacts (e.g. acidified lakes and streams and stressed or eliminated aquatic life, including fish) largely continue to this day and will probably continue for some years to come.

Air Quality – CFB technology and BACT controls would reduce potential air emissions of all criteria pollutants and HAPs, so that the HGS would not, in and of itself, generate significantly

adverse impacts on local and regional air quality. DEQ Air Quality Permit conditions would be set so as to prevent the region from being pushed into non-attainment of the NAAQS and MAAQS. Nevertheless, some minor to moderate degradation of ambient air quality would likely occur, and with increasing overall emissions in Montana and neighboring states from a variety of sources, including new and proposed coal-burning power stations, cumulative impacts over the coming decades could become significant.

With air quality more than any other individual resource topic covered in this EIS, potential cumulative impacts from a large number of mobile and stationary sources across a wide geographic domain are the major issue. An HGS plant would contribute incrementally to a minor or moderate extent toward cumulative impacts related to regional haze, visibility impairment in Class I areas, mercury dispersion and bioaccumulation, and global climate change.

Biological Resources – The Proposed Action would likely lead to short-term impacts to wildlife and vegetation by degrading air quality as well as to aquatic biota from degraded water quality. There would also likely be a long-term increase in mortality of terrestrial mammals by rail strikes and increased traffic on the access road. In a cumulative context, these would be considered minor incremental adverse impacts on biological resources. If wind turbines are erected at the Salem site, there would be some, still unquantifiable, potential for mortality to birds (primarily raptors) and bats. However, it appears that most bird and bat mortality to date has been from smaller turbines with faster-rotating (higher RPM) blades; larger turbines with larger, lower RPM blades tend to be less problematic. Overall cumulative impacts would likely be adverse but minor. However, given the rapid growth of the wind industry in this region of the country, long-term monitoring will be necessary to gauge its cumulative impact on bird and bat populations, if any.

Noise – The HGS would cause minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment. The HGS would also entail minor long-term impacts from increased noise along route of train carrying coal to power plant. The overall, long-term impact of noise from coal plant operation on receptors would be negligible to minor. There are no other planned, proposed, or likely facilities in the vicinity of the Salem site that would add to noise from the Proposed Action; therefore, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Recreation – The Proposed Action would cause negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There are no other past, present, or future planned projects in the area that would adversely impact recreation, so that cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Cultural Resources – There would be a major long-term impact on the existing Great Falls Portage National Historic Landmark because of the salience or visual incongruity of this large industrial facility – both the power plant and the wind turbines – being inserted into a predominantly rural landscape with historic significance. However, not all of the viewshed would be adversely affected, and proposed mitigation measures may offset impacts. In addition,

other parts of the NHL have already been encroached upon by modern developments, including the City of Great Falls itself and a major U.S. Air Force Base. Even the immediate vicinity at the Salem site now includes gas lines, transmission, distribution, and phone lines, rural homesteads. The Lewis and Clark Interpretive Center in Great Falls, a U.S. Forest Service interpretive facility, commemorates the entire expedition, and particularly the Great Falls portage. No other large, visually obtrusive facilities are known to be proposed for construction in or close to the NHL. Overall, the cumulative impact on cultural resources would be the same as that of the Proposed Action alone – adverse and significant.

Visual Resources – The proposed HGS and wind turbines would entail scenic impacts on the NHL of major magnitude, long-term duration, and small extent, because of the placement of a visually incongruous, industrial element into a rural landscape dominated not by human structures but by natural landforms and vegetation (both natural and cultivated). Overall, the cumulative impact on visual resources would equal that of the Proposed Action alone – adverse and moderately significant.

Transportation – Short-term construction-related impacts on road traffic would be of moderate magnitude, medium-term duration, and small extent, and rated as significant by MDT. There would also be minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect. No other projects, actions, or trends are known that would affect transportation locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Farmland and Land Use – Conversion of farmland to industrial land use would have impacts of minor magnitude, long-term (permanent) duration, and medium extent. Impact on land use (property values) from the operation of a power plant at Salem would be of moderate magnitude, long-term duration, medium to large extent, and possible likelihood. The likelihood that the siting of an industrial facility eight miles from Great Falls would attract further development to this area, leading to greater farmland conversion and loss, is not considered great, given the availability of other sites closer to town. Cumulative adverse impacts on farmland and land use would thus be equal to direct and indirect impacts from the HGS, and are deemed to be minor.

Waste Management – Construction impacts on waste management would likely be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on waste management for the Salem Site would be of moderate magnitude, long-term duration, and medium extent. No other projects, actions, or trends are known that would affect waste management locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which would be moderately adverse.

Human Health and Safety – Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent. Several other facilities in the area are major sources of air emissions, and modeling presented in Chapter 4 determined that the HGS would not cause or contribute to any exceedances of the NAAQS or the MAAQS. No other projects, actions, or trends are known that would affect

human health and safety locally. Thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.
Socioeconomics – During the construction phase of the HGS, there would be a moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During long-term operational phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent. Overall long-term cumulative impacts from the HGS and other recent projects in the area would be of minor magnitude and economically beneficial.

5.5 ALTERNATIVE SITE – INDUSTRIAL PARK

The Alternative Site would also contribute to certain cumulative impacts, which are discussed briefly below and presented in Table 5-4.

Soils, Topography, and Geology – Cumulative impacts would be similar to those related to the Proposed Action. Extensive site grading and excavation activities would disturb a considerable amount of soil and lightly alter topographic contours at the alternate site, and overall, soil resource impacts from construction activities would have a moderate magnitude, medium-term duration, and medium extent. Combined with other construction activities in the Great Falls area and Cascade County, plus general long-term degradation of agricultural lands from water and wind erosion (offset somewhat by setting aside CRP lands) and gradual loss of soil fertility, there would be an overall minor adverse cumulative impact on soils from the Alternate Site and connected actions like pipeline and transmission line construction.

Water Resources – Cumulative impacts would be very similar to those related to the Proposed Action. Site construction would involve negligible to minor impacts on receiving water quality from increased storm water runoff and possible contamination. Over the long term, there would be negligible to minor impacts on Missouri River flows from water withdrawals and consumptive use. Basin-wide water quality and quantity (seasonal flows downstream) on the Missouri will likely continue to be problems in the future, and by using water consumptively, the Proposed Action would contribute incrementally to a negligible to minor degree toward these continuing, cumulative adverse effects.

By releasing some quantity of sulfur dioxide to the atmosphere, any new coal-fired power plant would also contribute incrementally to significant cumulative impacts on the water quality of the nation's water bodies from acid deposition. However, the distance of HGS from areas of the country and continent where acidification is a serious problem, primarily poorly buffered Canadian Shield parent rocks/soils of the Upper Midwest and Northeast – may mean that its SO_2 emissions have limited or negligible impacts on these vulnerable areas. While innovative regulatory tools (cap and trade program) and control technology under the Clean Air Act Amendments of 1990 have made substantial strides in reducing SO_2 emissions nationwide, the significant impacts (e.g. acidified lakes and streams and stressed or eliminated aquatic life, including fish) largely continue to this day and will probably continue for some years to come.

Table 5-4. Summary of the Potential Long-term Cumulative Impacts to which the Alternative Site for SME's Power Plant would Contribute Incrementally

Resource topic	Proposed Action	Other Past, Present and Future Actions	Cumulative Impacts
Soils, Topography, and Geology	*	*	*
Water Resources	*	**	**
Air Quality	*	**	**
Biological Resources	*	*	*
Noise	*	*	**
Recreation	*	*	*
Visual Resources	*	*	*
Transportation	**	*	**
Farmland and Land Use	*	*	*
Waste Management	**	*	**
Human Health & Safety	*	*	*
Socioeconomics	++	+	+
Environmental Justice/Protection of Children	*	*	**

Key:
Adverse: * Minor Impact ** Moderate Impact *** Major Impact
Beneficial: + Minor Impact ++ Moderate Impact +++ Major Impact
No Impact: 0

Impact Intensity Definitions:
Minor – Change in a resource area occurs, but no substantial resource impact results.
Moderate – Noticeable change in a resource occurs, but the integrity of the resource remains intact.
Major – Substantial impact/change in a resource area that is easily defined, noticeable & measurable.

Air Quality – Cumulative impacts would be very similar to those associated with the Proposed Action. In the short-term, there may be slightly greater cumulative air quality effects on local residents from combined emissions and fugitive dust, in conjunction with other ongoing and future development near the Industrial Park. Over the long run, CFB technology and BACT

controls would reduce potential power plant air emissions of all criteria pollutants and HAPs, so that SME's plant would not, in and of itself, generate significantly adverse impacts on local and regional air quality. DEQ Air Quality Permit conditions would be set so as to prevent the region from being pushed into non-attainment of the NAAQS and MAAQS. Nevertheless, some minor to moderate degradation of ambient air quality would likely occur, and with increasing overall emissions in Montana and neighboring states from a variety of sources, including new and proposed coal-burning power stations, cumulative impacts over the coming decades could become significant.

With air quality more than any other individual resource topic covered in this EIS, potential cumulative impacts from a large number of mobile and stationary sources across a wide geographic domain are the major issue. The Alternative Site, to the same extent as the Salem site, would contribute incrementally to a minor or moderate extent toward cumulative impacts related to regional haze, visibility impairment in Class I areas, mercury dispersion and bioaccumulation, and global climate change.

Noise – Cumulative impacts may be somewhat greater than those related to the Proposed Action. The proposed power plant would cause minor to moderate, short-term adverse impacts from intermittent noise during construction, both from equipment at site and transit of city and county streets by workers and equipment. The power plant would also entail minor long-term impacts from increased noise along route of train carrying coal to power plant. The overall, long-term impact of noise from coal plant operation on receptors would be negligible to minor. Increased traffic, possible widening of U.S.-87, the new IMC plant and possible others at the Industrial Park, and possible continuing residential and commercial development locally would all increase noise. Overall cumulative impacts would likely be moderately adverse but not significant.
Recreation – Cumulative impacts would be similar to those related to the Proposed Action. The Alternative Site would cause negligible to at most minor impacts on recreation in the immediate project vicinity and wider Great Falls area. There are no other past, present, or future planned projects in the area that would adversely impact recreation, so that cumulative impacts would be equal to the direct and indirect impacts from the power plant itself, which are at most minor.

Visual Resources – The Alternative Site would likely result in scenic impacts of moderate magnitude, long-term duration, medium or localized extent. No other projects, actions, or trends are known that would affect visual resources locally, and thus, cumulative impacts would be equal to the minor direct and indirect impacts from the construction and operation of SME's plant at the Industrial Park.

Transportation – Construction-related impacts on road traffic would be of minor magnitude, medium-term duration, and small extent. There would also be minor, temporary construction-related impacts on rail transport on the BNSF line to which a rail spur would connect. The long-term increase of traffic volumes on U.S.-87 running near the Industrial Park site – related to general development in the area, not the proposed SME plant, may be offset by proposed widening of this road. No short-term cumulative impacts are expected, but there could be long-term, minor adverse cumulative impacts on traffic.

Farmland and Land Use – Conversion of farmland soils would have impacts of minor magnitude, long-term (permanent) duration, and medium extent at the Industrial Park site. Impacts on adjacent land uses (especially residential) from the operation of a power plant at the Industrial Park Site would be minor magnitude, long-term duration, medium extent, and possible likelihood. The combination of the IMC plant, SME's plant, and possible future industrial facilities at the Industrial Park site would represent the realization of this site's intended uses, but could have minor adverse cumulative impact on nearby land uses.

Waste Management – Construction impacts on waste management at the Industrial Park would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on waste management for the Industrial Site would be of minor to moderate magnitude, long-term duration, and small extent. No other projects, actions, or trends are known that would affect waste management locally, and thus, cumulative impacts would be equal to the direct and indirect impacts from the Alternative Site, which would be moderately adverse.

Human Health and Safety – Construction-related impacts on human health and safety would be of minor magnitude, medium-term duration, and small extent. Operation-related impacts on human health and safety would be of minor magnitude, long-term duration, and medium extent. Several other facilities in the area are major sources of air emissions, and modeling presented in Chapter 4 determined that the HGS would not cause or contribute to exceedances of the NAAQS or the MAAQS. No other projects, actions, or trends are known that would affect human health and safety locally. Thus, cumulative impacts would be equal to the direct and indirect impacts from the HGS, which are at most minor.

Socioeconomics – Cumulative socioeconomic impacts would be very similar to those related to the Proposed Action. During the construction phase of the power plant, there would be moderately beneficial effect on the socioeconomic environment of the local and regional area, including increases in employment opportunities, total purchases of goods and services, and an increase in the tax base. During the long-term operational phase, beneficial socioeconomic impacts would be of minor magnitude, long-term duration and medium extent. Overall long-term cumulative impacts from the SME power plant and other recent projects in the area would be of minor magnitude and economically beneficial.

Environmental Justice and Protection of Children – Impacts of plant operation at the Industrial Park site on low-income residents would be of minor to moderate magnitude, long-term duration, medium extent, and unlikely likelihood. Emissions from the proposed plant could be compounded by other industrial emissions in the vicinity, if the Industrial Park further develops, which could potentially place an undue burden of air pollutants on residents downwind of the facilities, particularly children, and if present, low-income residents. Additional air modeling would be required in order to determine if this risk does actually exist. Thus, cumulative impacts could be minor to moderately adverse.

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